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VOL. XXXVIII. No. 152.

OCTOBER, 1929.

# MIND

## A QUARTERLY REVIEW

OF

### PSYCHOLOGY AND PHILOSOPHY.

OCT 21 1929

EDITED BY

PROF. G. E. MOORE,

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PUBLISHED FOR THE MIND ASSOCIATION BY  
MACMILLAN & CO., LIMITED,  
ST. MARTIN'S STREET, LONDON, W.C. 2.

NEW YORK: THE MACMILLAN COMPANY.

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Yearly Subscribers will receive MIND *post free* from the Publishers on payment (in advance) of Sixteen Shillings.

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# MIND

## A QUARTERLY REVIEW

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### I.—PROFESSOR EDDINGTON'S GIFFORD LECTURES.

BY R. B. BRAITHWAITE.

THE lectures which Professor A. S. Eddington delivered on the Gifford Foundation in the University of Edinburgh at the beginning of 1927, and which were published by the Cambridge University Press under the title *The Nature of the Physical World*<sup>1</sup> at the end of 1928, have had a reception which does credit to the intelligence of the English-speaking public. Mr. Eddington is at the present day almost the only scientist of the first rank who can and will write in such a manner as to appeal to the non-specialist; and those who, like myself, consider that one of the greatest menaces to civilisation is the ever widening gulf between scientific and common knowledge must acclaim the advent of the new Huxley who speaks in such familiar language and yet with such authority. Mr. Eddington's gifts as an exponent of science are peculiarly English—I do not think that any German could write a book like this, and no Frenchman since Henri Poincaré has done so—and we may rejoice that he is not without honour in his own country.

But this book is not merely an *œuvre de vulgarisation*: were it so there would be nothing for a writer in MIND to do except to extol it in such a way as to get the greatest number of his fellow-philosophers to read it. Its great interest lies

<sup>1</sup> *The Nature of the Physical World*. By A. S. Eddington, Plumian Professor of Astronomy in the University of Cambridge. Cambridge: at the University Press, 1928. Pp. xix, 361. 12s. 6d.

in its being this and something more as well. Its aim, besides being "to make clear the scientific view of the world as it stands at the present day, and, where it is incomplete, to judge the direction in which modern ideas appear to be tending" (p. vii), is also to put forward, tentatively but definitely, a philosophy of nature and (as is proper for a Gifford Lecturer) a philosophy of spirit. In doing this he has walked into the lions' den, and the lions (Mr. H. W. B. Joseph in the *Hibbert Journal* of April and Mr. G. Dawes Hicks in a paper read to the Aristotelian Society in May) have not been slow to fall upon so delectable a morsel. But Mr. Joseph has not had nearly as good a meal as he thinks he has had; and, though Mr. Dawes Hicks has polished off several excrescences (I cannot regard Mr. Eddington's mind-stuff theory as very fundamental), a good deal of the anatomy remains. The present reviewer will behave more like a cancerous growth than like a lion. I do not propose to attack the external façade of universally accepted science, nor to examine in detail the final metaphysic: instead I shall mainly discuss Mr. Eddington's views on physical laws and the things with which they deal, views upon which great emphasis is laid but which I believe to be by no means impregnable. This treatment will have the two advantages of dealing with Mr. Eddington's strongest theses and of not traversing much of the ground of Mr. Joseph's and of Mr. Dawes Hicks's criticisms.

I want to make it clear, however, that, although this article concentrates attention upon the weakness of some of Mr. Eddington's strong points, I think that this book is one of the most important works (philosophical as well as scientific) that has appeared for many years. On the subject with which it is concerned—the nature of the physical world—Mr. Bertrand Russell's *Analysis of Matter* is its only rival; and though Mr. Russell's conclusions are, I think, nearer the truth, he has not the advantage of being a practising physicist which gives such a flavour to Mr. Eddington's writing. Philosophical books written by distinguished scientists frequently disappoint the professional philosopher: the metaphysics is so frequently Mach's and the science the less difficult parts of the ordinary text-books. Mr. Eddington's metaphysic is, it is true, what W. K. Clifford's would have been had he been a member of the Society of Friends instead of a militant atheist; but his theory of physical knowledge is, I think, quite original, and his exposition of modern scientific thought is by means of brilliant illustrations with which he hopes to pass the barrier of ignorance of the higher

mathematics. To take a particular example, the description at the end of the book of scientific discovery as analogous to the fitting together of a jig-saw puzzle is more illuminating than any treatise on scientific methodology. Mr. Eddington succeeds perfectly in conveying some of that excitement which is felt by physicists living in a great period of physical discovery, and he makes us feel that we share their good fortune.

The book consists of an Introduction, a Conclusion and fifteen chapters. Chapters I., II. and III. (The Downfall of Classical Physics, Relativity and Time) deal with the Special Principle of Relativity, Chapters VI. and VII. (Gravitation: the Law and Gravitation: the Explanation) deal with the General Principle of Relativity, and Chapter VIII. (Man's Place in the Universe) recounts the findings of modern cosmology. Chapters IX. and X. (The Quantum Theory and The New Quantum Theory) deal with modern atomic physics, the former treating of the theories before 1925, and the latter of the fantasies deriving from Heisenberg's paper in the autumn of 1925, particularly the wave-mechanics of Schrödinger. These eight chapters are essentially a popular presentation of the state of contemporary physics by one who has contributed not a little to that present state, and in the first section of my paper I shall confine myself to a few pages of discriminate appreciation. But, sandwiched between Special and General Relativity, come two chapters (IV., "The Running-Down of the Universe," and V., "Becoming") in which Mr. Eddington propounds what seem to me very questionable doctrines about the Second Principle of Thermodynamics and the nature of time; and I shall deal separately with these subjects. The last five chapters (XI., World Building, XII., Pointer Readings, XIII., Reality, XIV., Causation, and XV., Science and Mysticism) are definitely philosophical, and I shall treat them under the headings of "The World of Physics" and "Spiritual Reality". Of course in a book whose aim is to discuss the effects of modern science upon philosophy the popular exposition of science and the development of an idealistic metaphysic are thoroughly intermixed; and the separation which I am making is purely for the convenience of discussion.

### (1) *The Theories of Modern Physics.*

Professor Eddington's exposition of the doctrines associated with the name of Einstein differs in several important respects from those usually given by popular writers on Relativity. This is partly due to the fact that in his *Space Time and*

*Gravitation* (1920) he has already given one of the best popularisations of this notoriously unpopularisable subject and partly to the necessity for reaching "the later and more recondite developments in which the conceptions of greatest philosophical significance are to be found" (p. vii). But I think it is also due to the theory, which in 1920 was still fighting for its life, now being accepted by every person competent to form an opinion upon it. So apologies for the theory, and explanations that after all it makes very little difference to anything, are now unworthy of a believer. And Mr. Eddington defends Einstein's physics with a quiet effrontery which I for one find very sympathetic. For example, he writes of the alternative laws of gravitation :—

"It is essential to our faith in a theory that its predictions should accord with observation, unless a reasonable explanation of the discrepancy is forthcoming; so that it is highly important that Einstein's law should have survived these delicate astronomical tests in which Newton's law just failed. But our main reason for rejecting Newton's law is not its imperfect accuracy as shown by these tests; it is because it does not contain the kind of information about Nature that we want to know now that we have an ideal before us which was not in Newton's mind at all" (p. 121).

The strength of the relativist position cannot be fully realised without a knowledge of its scientific background: Mr. Eddington puts this in a paradoxical form by saying that Sir Ernest Rutherford and not Dr. Einstein is "the real villain of the piece" (p. 1). For when it is accepted that "the atom is as porous as the solar system" and that the forces holding the atom together are electrical, the laws of electricity immediately take precedence over laws about rigid bodies. The essence of the first Theory of Relativity is that, in the conflict which arises between the possibility of the applicability to all systems of Maxwell's electromagnetic equations and of Newton's Laws of Motion, we accept the claims of the former and consequently modify the latter. And to a physicist convinced that material bodies are electrical systems and are not rigid in the old sense (which Mr. Eddington surprisingly calls being a "substance"), there can be no doubt as to the right choice. Mr. Eddington is certainly approaching the subject in the best way when he treats it in close connexion with the electrical constitution of matter, though this treatment assumes some knowledge of the development of physics during the last century.

A few of Mr. Eddington's statements seem to me to be unfortunately expressed and calculated to tease a philosopher unnecessarily. "Is the Fitz-Gerald Contraction real?" for example:—

"Is it really true that a moving rod becomes shortened in the direction of its motion? It is not altogether easy to give a plain answer. I think we often draw a distinction between what is *true* and what is *really true*. A statement which does not profess to deal with anything except appearances may be *true*; a statement which is not only true but deals with the realities beneath the appearances is *really true*.

... The shortening of the moving rod is *true*, but it is not *really true*. It is not a statement about reality (the absolute), but it is a true statement about appearances in our frame of reference" (pp. 33, 34).

I think that this is all very confusing. For Mr. Eddington is attempting to justify his previous assertion that there is a contraction of a rod on the earth moving round the sun. But here the contraction is neither "really true" nor "true," since it does not occur in the appearances to us. It only occurs in relation to a frame of reference which there is no temptation to us to take. Surely it is simpler to say straight out that distance between two particles is not a dual relation but a triple relation into which a frame of reference enters, and that the only valuable dual relation that can be extracted is in the cases when the two particles are relatively at rest and are permitted to fix the frame of reference as one in which they are at rest. In this "proper-length" there is no FitzGerald Contraction; and, if the eye does not contract, it is unnecessary for physics to speculate whether, if it did, we should see things shorter (as Mr. Eddington thinks) or better (as Mr. Joseph thinks). The FitzGerald Contraction seems to sit heavily on the neck of many a relativist; but it is a self-imposed burden.

In another connexion, also, Mr. Eddington seems to hedge on the question of the reference frame's entering into the meaning of length.

"I am prepared to admit that frames of space in spite of their present resemblance may in the future turn out to be not entirely indistinguishable. (I deem it unlikely, but I do not exclude it.) The future physicist might find that the frame belonging to Arcturus, say, is unique as regards some property not yet known to science" (p. 21).

But, even if some unique property of it is found (it has, by the way, one unique property which we now know—that Arcturus is at rest in it), this will not help to reduce the triple relation of distance between the two particles in a particular space-frame to a dual relation between the particles, unless this unique property is a property of the particles and not of Arcturus. And it is impossible for a space-frame to have a unique property which is analysable in terms of every pair of particles. The position of Einstein's theory is not merely (as Mr. Eddington goes on to say) that "the question of a unique frame of space does

not arise" (p. 21): it is that this question cannot arise. Mr. Eddington is being too kind to the critics who say that, although we cannot know which is the absolute frame of space, yet there is such a thing. If space is a section of a four-dimensional continuum, it cannot be determinate without a specification of the direction in which it is sliced.

What remarks I have to make upon Mr. Eddington's exposition of the Generalised Principle of Relativity bear upon his conception of physical laws as mathematical identities and are consequently reserved for a later part of this paper. I think that a physicist who did not accept Mr. Eddington's philosophy of physics would have expounded the theory of gravitation in rather a different way.

After a cosmological chapter in which Mr. Eddington adopts Sir James Jeans's view that the solar system could only have arisen out of a remarkable accident, we reach the atom. Before 1925 the processes within the atom were represented in ways which it was just possible to picture as mechanical models: the electrons revolving round the nucleus did, it is true, have to leap from one orbit to another at unspecified times and with infinite velocities, but at least they did move in orbits. Since 1925, however, there has been no value in thinking of an electron as being at any particular place in the orbit; it occupies the whole orbit at once. Indeed mechanical models have become quite unprofitable, for microscopic physics seems to derive from equations about entities which do not obey the commutative law of multiplication. [The fundamental equation seems to be  $qp - pq = i\hbar/2\pi$  where  $\hbar$  is Planck's constant of action and  $i$  is, as usual, the square root of  $-1$ .] Three theories have been produced as to the interpretation of these curious things since 1925; Mr. Eddington gives a sketch of Schrödinger's theory, which, he says, "is now enjoying the full tide of popularity, partly because of intrinsic merit, but also, I suspect, partly because it is the only one of the three that is simple enough to be misunderstood" (p. 210). According to Schrödinger, matter consists of waves and light consists of beats of these waves. What the waves are of and in is mysterious in the extreme: Mr. Eddington tells us that the wave-function  $\psi$  can be interpreted as the probability that one electron is in a certain place. So far as I can see, the function represents something like the density of electric charge, and I should prefer to think of the distribution of  $\psi$  throughout space as being itself the electron rather than to regard  $\psi$  as the probability that a point-electron is within a certain region in space. However, it is

almost certainly not worth disputing about the interpretation of wave-mechanics at this stage in its development: as Mr. Eddington says, it "is not a physical theory but a dodge—and a very good dodge too" (p. 219). Its comparative simplicity vanishes when we realise that each different wave-function  $\psi$  requires a complete three-dimensional space of its own to vibrate in, and the apparent continuity of the waves vanishes in a multiplicity of unrelated sets of dimensions. But, compared with Born and Jordan's infinite matrices or Dirac's "basal entities inexpressible by numbers or number-systems" (which Mr. Eddington fancies, p. 210), waves of probability moving with a velocity greater than light in private sub-æthers are on the imaginative level of the nineteenth-century billiard balls and vortices. As for the "Principle of Indeterminacy" advanced by Heisenberg in 1927, which Mr. Eddington states in the form "A particle may have position or it may have velocity but it cannot in any exact sense have both" (p. 220), one cannot bear to think of it. For the principle does not assert, as might appear at first sight, that given the definite position of the particle, its velocity is only a velocity between certain limits; for this might be reduced to more familiar conceptions by postulating a very complicated kind of atomism of space and time. But it asserts that, given this fairly definite position, the velocity may be anything so long as it has a definite mean error, *i.e.*, so long as most of the velocities in a series of instances fall within a definite limit. And this reduces the suggested fundamental law of atomic physics to a statistical law about the behaviour of a class of atoms.

"One would not be surprised if in the reconstruction of the scheme of physics which the quantum theory is now pressing on us, secondary law becomes the basis and primary law is discarded. In the reconstructed world nothing is impossible though many things are improbable" (p. 98).

It will be best to consider these statistical or secondary laws in connexion with their oldest exemplar—the Second Law of Thermodynamics.

## (2) *Entropy and Time.*

The ideas connected with the degradation of the energy of the universe are far from new; but the importance of entropy, like entropy itself, is always increasing.

"From the point of view of philosophy of science the conception associated with entropy must I think be ranked as the great contribution of the nineteenth century to scientific thought" (p. 103).

"The law that entropy always increases—the second law of thermodynamics—holds, I think, the supreme position among the laws of Nature.



If some one points out to you that your pet theory of the universe is in disagreement with Maxwell's equations—then so much the worse for Maxwell's equations. If it is found to be contradicted by observation—well, these experimentalists do bungle things sometimes. But if your theory is found to be against the second law of thermodynamics I can give you no hope; there is nothing for it but to collapse in deepest humiliation" (p. 74).

A law with these pretensions should have a pedigree above suspicion.

Entropy is a measure of "randomness" or "disorganisation". Mr. Eddington introduces it with the analogy of the shuffling of a pack of cards. Since I believe that he describes this incorrectly (even if it is a good analogy), I will follow him.

"If you take a pack of cards as it comes from the maker and shuffle it for a few minutes, all trace of the original systematic order disappears. The series will never come back however long you shuffle. Something has been done which cannot be undone, namely, the introduction of a random order in place of arrangement" (p. 63).

But he qualifies this statement in two ways. Firstly, the shuffling must be shuffling and not arranging: the pack must not be rigged.

"Secondly, it is not quite true that the original order never comes back. There is a ghost of a chance that some day a thoroughly shuffled pack will be found to have come back to the original order. That is because of the comparatively small number of cards in the pack. In our applications the units are so numerous that this kind of contingency can be disregarded" (p. 64).

But there is another factor which affects the probability of regaining the original order, and that is the number of operations of shuffling. If only you shuffle long enough it becomes not indeed certain but as probable as you like that any specific arrangement will appear. This is a direct consequence of Bernoulli's theorem in the calculus of probability—the theorem that, given certain conditions (which are satisfied in games of chance and in cases that are considered analogously), the probability that the actual frequency in a series of trials differs by less than some fixed amount, however small, from the frequency corresponding to the *a priori* probability, tends to certainty as the number of trials tends to infinity. You can always state a number of trials such that an event of any degree of improbability is extremely likely to happen. This is frequently a very large number, as in the case of shuffling a pack of cards. If a man shuffled a whist pack as rapidly as an individual molecule hits other molecules in air, and if a snail started to crawl round the universe (finite but unbounded) at the rate of one centimetre



during the life of the sidereal system, the snail would have got round the universe many millions of times before it would become at all likely that the man would have got the pack back to the original order. But by the time that it had made a hundred million circumnavigations, it would be almost certain that the pack would have reverted to its original organisation by the operations of shuffling alone. In the cases in which we consider the entropy, all the numbers (of molecules, electrons, their possible positions and velocities) are enormous, but they are probably not infinite; so, given time enough, it becomes almost certain that any physically possible organisation will occur even by the operations of purely random processes.<sup>1</sup>

To take Mr. Eddington's other example.

"If I let my fingers wander idly over the keys of a typewriter it *might* happen that my screed made an intelligible sentence. If an army of monkeys were strumming on typewriters they *might* write all the books in the British Museum. The chance of their doing so is decidedly more favourable than the chance of the molecules [in a vessel] returning to one half of the vessel" (p. 72).

But if only the monkeys strum for long enough, it is as certain as you like that all the books at present in the British Museum will be casually written. Time alone without the help of Maxwell's demon will suffice to get all the molecules into one half of the vessel.

So Mr. Eddington's remark that "shuffling is the only thing which Nature cannot undo" (p. 64) is, given infinite time, simply false. So far from the second law of thermodynamics being the supreme physical law, we know that, applied to all time, it is not even approximately true.

Of course the law may be very probable if we limit it to the next  $10^{100}$  years: I should be prepared to bet very heavily against my kettle freezing when I put it on the gas within this period. And since Mr. Eddington attaches great importance to secondary laws in general and to the increase of entropy in particular, I think it is worth hunting this most elusive conception a little further.

In the first place, what is the nature of entropy? It is the name given to "the practical measure of the random element" in the universe (p. 74). But is this "randomness"

<sup>1</sup> Mr. J. B. S. Haldane (*Nature*, Nov. 24, 1928) calculates, on Sir James Jeans's assumptions, that "if the present universe melts away into radiation, another equally improbable will develop in the course of about  $10^{100}$

10<sup>100</sup> years". By "equally improbable" is here meant "with as little entropy".

or "disorganisation" an objective property of the physical world or does it arise simply out of the way in which we regard the world? Mr. Eddington admits that it "is frankly of a much more subjective nature than most of the ordinary physical qualities," and that "it is subjective in the same sense that the constellation Orion is subjective". "That which is arranged is objective . . . but the association is the contribution of the mind which surveys" (p. 95). But in the shuffling of a pack of cards, which Mr. Eddington along with other writers takes as a valid analogue to the "running-down" of the universe, it is not only the association but the things which are associated that are subjective. Whether a pack of cards is shuffled or unshuffled depends not upon the cards as physical objects but upon the meanings I attach to them. If the cards were not symbols for me, they would not be in themselves either shuffled or unshuffled. So if this sort of shuffling is a true analogue to the second law of thermodynamics, we should take the law to be merely a statement of the way in which we choose to look at the world, a way which we can alter at any moment as easily as we can "arrange" a pack by altering the conventional meanings attached to the cards. I do not believe that entropy is quite as subjective as the order of a pack of cards (which, then, is not at all a good analogy); but I think it may be less absolute than Mr. Eddington thinks.

For what is "that which is arranged" in statistical mechanics? In the dynamical theory of gases it is the positions and velocities of the molecules, and these (we are now taught) are not absolute quantities but are relative to the frame of space. The entropy of a four-dimensional chunk of the universe is, it is true, invariant for the relativistic transformations. But how can the entropy of the universe at a time  $t$  have a definite meaning when the time section of the universe is left unspecified? Or how can it have a meaning at all, relative or absolute, if the universe is of de Sitter's type in which there are parts which bear no temporal relation to other parts? We are told that the group of ideas associated with entropy "have not essentially altered since the time of Boltzmann" (p. 63):<sup>1</sup> they certainly have not been harmonised with the ideas appropriate to the time of Einstein. The Eddington who in Chapter III. declines "to regard the world as *stratified* into a succession of instantaneous states" (p. 47: his italics) appears to be an entirely different man from the author of Chapter IV. who

<sup>1</sup> Boltzmann's statistical interpretation of entropy dates from 1866.

quotes with approval from the Rubaiyat about the Moving Finger, whose section of the universe can surely only be instantaneous from one point of view. If we agree with Mr. Eddington's dictum that "the unstratified pig is a simpler object to the biologist who wishes to understand how the animal functions" (p. 47), we shall regret to find him studying it "in the form of rashers" in the next chapter.

Another difficulty about entropy is that it is concerned with the *a priori* probability of a state of things, and in a great number of cases it is difficult to see upon what evidence this probability is based or how it is to be measured. An isolated physical system can be compared with other isolated systems, and so some show of justification can be found for assigning them numerical probabilities. But there is nothing with which the whole universe can be plausibly compared except the whole universe at another time: considerations of hypothetical universes will tell us nothing about the change of the actual universe unless we assume that at some time or other all these hypothetical universes exist. So modern statistical mechanics is built upon the assumption that in the long run the universe does everything it can do and passes through every possible phase, an assumption of which Mr. R. H. Fowler says that "it is extremely probable that this assumption is always untrue" (*Statistical Mechanics*, 1928, p. 8). Nevertheless "some similar assumption must be made in its place".

With assumptions of this sort it can be deduced that for all but a minute fraction of its time the universe never strays more than a minute amount from a state of maximum entropy. Then the problem arises as to how it has got to its present condition with apparently much less than the maximum possible entropy. Mr. Eddington mentions this difficulty only to reject contemptuously its most obvious solution:

"scientists and theologians alike must regard as somewhat crude the naïve theological doctrine which (suitably disguised) is at present to be found in every textbook of thermodynamics, namely that some billions of years ago God wound up the material universe and has left it to chance ever since" (p. 84).

This "deadlock" should make us chary of accepting far-fetched deductions from statistical laws: if I believed in the second law of thermodynamics as much as Mr. Eddington does, I should feel compelled to believe more than he does in an "incredible" First Cause. However, since the universe as we know it differs considerably from a "normal" universe in thermodynamical equilibrium, its behaviour may be quite

different from that of a "normal" one. A dwarf of four foot is not much interested in statistical statements about normal individuals of five foot eight, and the assumption that he will grow taller and taller can be defended on just the same lines as the law that the entropy of an abnormal world will always increase. The simplest solution (if God is rejected) of how the universe has got into its present satisfactory state is that at some time in the past it has been in a less satisfactory state and that its entropy has diminished. And this does not entirely contradict orthodox statistical mechanics which states not only that entropy always increases but also that it is extremely probable that the entropy of a system having less than the maximum possible amount will be greater at any future time and was greater at any past time. Entropy is like the White Queen's jam. "The rule is, more entropy to-morrow and more entropy yesterday—but never more entropy to-day. . . . It's more entropy every *other* day: to-day isn't any *other* day, you know." Like Alice, I feel that "it *must* come sometimes to 'more entropy to-day'" and find it all "dreadfully confusing".

I have discussed entropy at some length partly because Mr. Eddington's authority may induce belief in that "inexorable running-down of the world" which so terrified our fathers but partly because of Mr. Eddington's doctrine that statistical or secondary laws will supersede primary laws in physics. So I have tried to show that the foundations of the statistical law *par excellence* are extremely shaky. All my criticisms do not apply to other statistical laws, such as the law stating the frequencies of different electron jumps in the atom (p. 301); but certainly all statistical laws depend upon comparing the probability of some system with the probability of some other system. As Mr. Eddington says :

"All probabilities rest on a basis of *a priori* probability, and we cannot say whether probabilities are large or small without having assumed such a basis. In agreeing to accept those of our calculated probabilities which are very high as virtually equivalent to certainties on the old scheme, we are as it were making our adopted basis of *a priori* probability a constituent of the world structure—adding to the world a kind of symbolic texture that cannot be expressed on the old scheme" (p. 305).

It seems to me that to adopt a basis of probability involves either an extensive experience of observed frequencies (which we rarely have) or the assumption of primary laws permitting us to assert equiprobabilities. So I doubt whether there is ultimately an "unbridgeable hiatus" (p. 77) between primary and secondary law, and I feel it would be very rash to discard the former in favour of the latter when this is still so

mysterious. No writer on statistical mechanics knows precisely what he means by the "probabilities" or "weights" which he uses; but it is not for a philosopher who distrusts every theory of probability to demand that he should set his house in order, especially since the progress of physics at the present time requires the greatest amount of disorder. Nevertheless physics working by "dodges" should recognise them for what they are worth.

Another reason why Mr. Eddington attaches so much philosophical importance to the philosophically most unsatisfactory conception of "organisation" or "entropy" is that he can conceive of no other way of explaining the passage of time.

"The great thing about time is that it goes on. But this is an aspect of it which the physicist sometimes seems inclined to neglect. In the four-dimensional world . . . the events past and present lie spread out before us as in a map. The events are there in their proper spatial and temporal relation; but there is no indication that they undergo what has been described as 'the formality of taking place,' and the question of their doing or undoing does not arise. We see in the map the path from past to future or from future to past; but there is no signboard to indicate that it is a one-way street" (p. 68).

This signboard, which is not given by any of the primary laws of physics, is, according to Mr. Eddington, provided by the second law of thermodynamics. Mr. Eddington does not identify the "becomingness" of the world with the increase of its entropy, but he holds that the latter is the only physical criterion for the former, and that our "direct insight into 'becoming' which sweeps aside all symbolic knowledge as on an inferior plane" (p. 97) is derived from a reading of an entropy-clock in the brain. Now, if Mr. Eddington had identified the passage of time with the increase of entropy, it would be possible to maintain that our knowledge of the former was derived from an instrument which measured the latter. But, if they are different, we must know what the passage of time is in order to know that the entropy-clock is measuring it and not something else. There is no answer to Mr. Joseph's question "How can I acquire my consciousness of [duration and time-order] by a consultation with brain-cells that must be useless until I have acquired it?" And, even if there were, Mr. Eddington's argument rests on two very doubtful premisses. He assumes, in the first place, that increase of entropy is the only physical process that can show the sense of time. He defends this by reference to the "Principle of Detailed Balancing," which states that "in thermodynamical equilibrium direct and converse processes

occur with equal frequency" so that "every statistical enumeration of the processes is unaltered by reversing the time-direction" (p. 80 n.). But thermodynamical equilibrium is as distant and hypotheticalal as the conversion of the Jews, and when it occurs time (in the physical world) will have lost its arrow anyway, according to Mr. Eddington. And the principle only states a statistical fact about a great number of brains, and the physical processes telling the time might be different for different brains. Mr. Eddington's second assumption (this time unstated) is that there must be a physical process in the brain corresponding to every mental process. And he makes this in that field which is most mysterious and in which it is therefore rashest to take anything for granted. We have a direct knowledge of the sense of time: unlike Mr. Eddington, I should say that we had awareness of this through our sense-organs (in the cases when we know directly that a sense-datum A is before a sense-datum B); but the origin of this knowledge is not the least mysterious part of the supreme mystery of consciousness.

The final answer to Mr. Eddington's theory of the criterion of time-direction in the physical world is that, as I have been at considerable pains to point out, entropy does not always increase and consequently cannot serve as a criterion for the passage of time. It would be almost as plausible to assert that the sense of time was determined by the direction of fall of the birth-rate. And I do not sympathise with Mr. Eddington's desire to find this sense in the world of physics. As he carefully points out, neither in classical nor in relativity physics does the sense of time enter. In the world of Newton the time-axis is fixed absolutely, in the world of Minkowski the time-axis is fixed as lying within a definite cone; but in neither case do any physical equations determine a direction along this axis. "The laws of Nature admit of the undoing as easily as of the doing" (p. 65). When Mr. Eddington threw down his piece of chalk so that it broke in half before his Edinburgh audience, he complained that the primary laws of physics alone would not enable him to distinguish between the breaking of the chalk and its unbreaking, and consequently considerations of entropy must be called in. But why should he expect the physical world in itself to tell him whether or not he is looking at it right way up? If physics can represent the complete system of world-lines in space-time, I do not require that it shall also show nature as passing or becoming. "The dynamic quality of the familiar world which cannot be parted from it without disaster to its significance" (p. 110) may quite well arise out of our con-

sciousness of the physical world. It is conscious minds that pass, not points on world-lines.

Le temps s'en-va, le temps s'en-va, ma Dame,  
Las ! le temps non, mais nous, nous en-allons.

### (3) *The World of Physics.*

Professor Eddington, as we should expect, approaches the problems of the nature of the entities and laws of physics from the direction of physics and not from the direction of the theory of knowledge. He contrasts his method of approach with that of Dr. Whitehead, who is attempting "to reach the physical world" from "the familiar world of consciousness"; and he agrees that "from the point of view of philosophy it is desirable that this entrance should be explored" (p. 249). But it is quite clear that Mr. Eddington regards himself as attempting a quite different task, and as tunnelling from the opposite side of the mountain to meet Dr. Whitehead. Consequently, I do not propose to discuss the various epistemological and psychological remarks which are freely scattered throughout the book. It would be unprofitable to ask Mr. Eddington how he knows the various things he asserts, for the theory of knowledge in general is not the subject with which he is concerned. When Mr. Eddington says, for example, that "no one can deny that mind is the first and most direct thing in our experience" (p. 281) or that "our bodies are more mysterious than our minds" (p. 277), one can only gasp and pass on. One should always discuss a philosopher's strongest points and not his *obiter dicta*; so I shall say very little about Mr. Eddington's most unsatisfactory epistemology (Mr. Dawes Hicks has dealt with this severely enough) and shall comment instead upon his theory of the nature of physics.

"The whole scientific enquiry starts from the familiar world and in the end it must return to the familiar world; but the part of the journey over which the physicist has charge is in foreign territory" (p. xv). This "foreign territory" consists of entities which we postulate at will and of which we have only symbolic knowledge until they lead us to pointer-readings which we can observe. The less we know about these entities the better, Mr. Eddington suggests; and the physical laws which we derive from the relations of these entities are mathematical identities and do not "control". "The earth goes anyhow it likes" (p. 148). Mr. Eddington sketches this process in his chapter on "World Building," where he makes it appear as if practically



nothing was assumed about the primal entities. I did not find the first part of this chapter intelligible until I discovered that Mr. Eddington was attempting to describe in popular language what he had presented in § 91 of his *Mathematical Theory of Relativity*<sup>1</sup> as a generalisation of Weyl's field theory. But the mathematical exposition discloses many assumptions which have disappeared from the popular treatment, and their recognition seems to me to put quite a different complexion upon the theory, less startling but more credible.

The process of "world building," we are told in the Gifford Lectures, starts with relata and relations between them, both of these entirely general. "To distinguish the relata from one another we assign to them monomarks. The monomark consists of four numbers" (p. 231). But it is no good saying distinguish this pig from that pig by assigning to each four numbers unless it is possible so to distinguish them. The sign for the set of four numbers cannot be a proper name for the relatum; if it were, it would be the symbol for the relatum and not for the set of four numbers: "(1, 2, 3, 4)" would mean this pig and not (1, 2, 3, 4). So in order that the monomark shall distinguish the relatum from all other relata, it must be a uniquely descriptive name. The relatum must be identified as being the thing which has Q to the set of four numbers ( $a, b, c, d$ ). Moreover, unless the relation Q is the same for all the relata and unless only one thing has this relation to the specific ( $a, b, c, d$ ), we shall not be certain that we have distinguished them by assigning to them different monomarks. Consequently, Mr. Eddington's first sentence has involved him in asserting the knowledge of a relation (one-many or one-one) holding between every relatum and a set of four numbers.

Next for Mr. Eddington's relations. "We assume that, considering a relation between two relata, it will in general be possible to pick out two other relata close at hand which stand to one another in a 'like' relation" (p. 232). By "like" is meant merely that there is a symmetrical relation S sometimes holding between  $aRb$  and  $cRd$ . But what is meant by "close at hand"? "As yet space and time have not been built. Perhaps we might say that only a few of the relata possess relations whose comparability to the first is definite, and take the definiteness of the comparability as the criterion of contiguity. I hardly know" (p. 232). But more than a mere qualitative contiguity is required in order

<sup>1</sup> I shall refer to this book (2nd edition, 1924) as M.



that limiting operations may be considered : the least that is necessary is a serial order of the relata. This can be obtained in only two ways—either by the assumption that the relation  $S$  admits of degrees of greater and less so that we can say that the relation of  $aRb$  to  $cRd$  is less  $S$ -y than that of  $aRb$  to  $eRf$ , or by the assumption that the serial order of the relata is given independently of the relation  $S$ . In the former case we have to assume the existence of very complicated relations (e.g., Mr. Russell's ABCD being more parallelogramical than ABEF: *The Analysis of Matter*, p. 105): in the latter case we have to assume further properties of the relata. When Mr. Eddington says lightly, "We should also arrange at this stage that the monomarks are so assigned as to give an indication of contiguity," he is positing that all the relata have some common determinable property (which may be given in terms of  $S$ ), that the determinate properties under this determinable can be arranged in a serial order and that every relatum has one and one only of these properties. Mr. Eddington is willing to admit that "the building at this point shows some cracks," but thinks that "it should not be beyond the resources of the mathematical logician to cement them up" (p. 233). But even the mathematical logician cannot make cement without lime.

So Mr. Eddington is just gently befooling us when he pretends to derive by pure thought 256 coefficients giving "a numerical measure of the structure surrounding the initial relatum" and gravely tells us that "the method is not so artificial as it appears at first sight" because "unless we shirk the problem by putting the desired physical properties of the world directly into the original relations and relata, we must derive them from the structural interlocking of the relations". He has put the desired physical properties into the original entities—not, of course, in the form in which he afterwards takes them out, but in a form from which the results logically follow. When he says that "the axiom of comparability of contiguous relations only discriminates between like and unlike, and does not initially afford any means of classifying various degrees and kinds of unlikeness" (p. 234), he conceals the fact that in this case an original serial order among the relata must be assumed in order to get the contiguity. (See M., p. 225 and Bertrand Russell, *op. cit.*, p. 56). All this is really obvious : the mathematician, like the conjurer, can only draw out of the hat what he has put into it (though he may transform this marvellously): the quickness of Mr. Eddington's hand may deceive the eye; it cannot change the nature of mathematics.

The curious thing is that, in the section of *The Mathematical Theory of Relativity* where this process of world building is expounded, there is no conjuring. This, I think, is largely due to the fact that in the mathematical treatise Mr. Eddington uses geometrical language which he very reasonably fears would mislead readers unacquainted with the meaning of a "space" in pure geometry. But the language of pure geometry is the appropriate language for the purpose: his object then appears clearly as an attempt to derive the metrical properties of a "space" out of its ordinal properties together with an axiom of "parallel displacement," or "comparability of contiguous relations," the "points" of the "space" corresponding to the relata and the "displacements" between two points corresponding to the relations between the relata of the Gifford Lectures. If he had said firmly that his object was to construct a "space" suitable for his physics with the fewest possible spatial (in the common or philosopher's sense) properties, he would not have neglected to mention those properties which a set of entities must have for even the purest geometer to call it a "space". "In the game of world-building we lose a point whenever we have to ask for extraordinary material specially prepared for the end in view" (M., p. 237). Perhaps: but it is usually thought better to lose a point than to produce the ace of trumps from your sleeve.

The "world-geometry" which Mr. Eddington is building up with his 256 coefficients is one designed to include in its scope the whole of field physics, electromagnetism as well as mechanics. It is an "illustrative geometry"—a graphical representation of all the quantities of physics at once.<sup>1</sup> And in this case I cannot understand the importance which Mr. Eddington attaches to the fact that in his world-geometry the laws of field physics appear as mathematical identities. He seems to me to be describing what has been the procedure of mathematical physics for the past 200 years. Compare, for example, Mr. Eddington's treatment of Maxwell's electromagnetic equations with the ordinary mathematical treatment of the oscillation of a simple pendulum. In this case we take a perfectly abstract differential equation  $\frac{d^2x}{dt^2} + k^2x = 0$ ,

<sup>1</sup> "Each attempt to unify gravitation and electromagnetism has been associated with what may be called an 'illustrative' geometry or world-geometry. A qualifying adjective is necessary, because I think it is now common ground that the actual geometry (obeyed by measured lengths, angles, etc.) is Riemannian" (A. S. Eddington on "Einstein's Field-Theory," *Nature*, Feb. 23, 1929). See also M., pp. 196 *et seq.*

solve it by purely mathematical methods and derive a formula for  $x$  in terms of  $t$ ,  $k$  and two arbitrary constants:

$$x = a \sin (kt + b).$$

Then, if we identify  $x$  with the displacement of the pendulum and  $t$  with the time and assume that the displacement and the time are related by the differential equation, it is a mathematical identity that the times of swings of the pendulum are equal; or, in Mr. Eddington's language, violation of isochronousness is "unthinkable". But it is only "unthinkable" in relation to the assumptions we have already made, which include the "controlling law" that the physical quantities are connected by the differential equation. Mr. Eddington's deduction of Maxwell's equations seems to me similar in essentials. He starts with a pretty general tensor equation (expressing the structure "surrounding the initial relatum" in terms of the notion of "parallel displacement") and obtains from this certain mathematical identities. Then, when the terms in these identities are identified with electric and magnetic quantities, the identities become Maxwell's electromagnetic equations. But there is no logical compulsion upon us to make such an identification, and we only make it because the electromagnetic equations thus obtained are true as a matter of experimental fact. Mr. Eddington proceeds "by inquiring first what experimental properties the physical tensor possesses, and then seeking a geometrical tensor which possesses these properties by virtue of mathematical identities" (M., p.222). The whole method is that of confirming hypotheses by verifying their consequences; and this has been the method of every advanced science since the Renaissance, although Jevons perhaps first realised the exact nature of the procedure. There is no novelty in the status of Maxwell's equations in Mr. Eddington's system: the features distinguishing the new methods are that (1) it has been found that from a few hypotheses of pretty fair generality (though not of the generality that the Gifford Lecturer would have us suppose) a great number of quite definite laws can be deduced, (2) in this deduction graphs are very useful, (3) the identification with the observed quantities is most easily made at a late stage in the deductive argument. Doubtless these features are of great methodological interest; but they hardly suffice to change field physics from an inductive science to a branch of pure mathematics. Maxwell's laws are none the less "controlling laws" because they can be deduced from more general hypotheses: the

"selective influence of the mind" (p. 239) consists in selecting exactly those hypotheses which entail Maxwell's laws, and the fact that these do so follow increases the likelihood of the hypotheses being true as well as selected.

It might be contended (Mr. Eddington suggests it) that the laws of arithmetic are in exactly the same position as the physical field laws, since we can only apply the law  $2 + 2 = 4$  when we know that we have two mutually exclusive classes each containing two members and, if such classes could not be found experimentally the law would have no application. But in pure mathematics (to use Mr. Russell's epigram) we never know what we are talking about, whereas in field physics we do know (or assume we know) something of what we are talking about—that the relata have certain properties and relations—without which knowledge we should have no reason for asserting the field laws (even without reference to observed quantities).

So much for Mr. Eddington's "world-geometry"—a conventional graphical representation of the quantities of physics. But what of the geometry of the world in a less purely mathematical sense? "I do not think it can be disputed that, both etymologically and traditionally, geometry is the science of measurement of the space around us; and however much the mathematical superstructure may now overweigh the observational basis, it is properly speaking an experimental science" (p. 162). That this "natural geometry" is different from the system of the chapter on "world-building" appears in this book from Mr. Eddington's insistence as against Mr. Russell and Dr. Broad that it is not a matter of convention as to whether space-time is regarded as Euclidean or non-Euclidean. Mr. Russell had said that he did not see why it should be necessary either with Mr. Eddington to adopt or with Dr. Whitehead to reject Einstein's non-homaloidal space-time. "The matter seems to be one of convenience in the interpretation of formulæ" (*Analysis of Matter*, p. 78). And Dr. Broad had agreed with Mr. Russell on the grounds that "each of these distinguished relativists has refuted the other by doing what, in his opponent's view, should be impossible" (*MIND*, Vol. 37, p. 90). If it were an "illustrative" geometry that was in question, Mr. Russell and Dr. Broad would be clearly right. Mr. Eddington has made it quite clear that he does not regard the "world-geometry" of his general field theory as contradicting that originally proposed by Weyl or that proposed by Einstein which attracted such extraordinary publicity last autumn. So it would be entirely a question of

"convenience" and those who, like Dr. Whitehead, prefer homaloidality to convenience would be free to introduce their gravitational fields of force. Mr. Eddington's virtuous indignation at those who "cook" or defend "cooking" and at those "who start from the assumption that my words mean nothing in particular" (p. 160) can only be justified if he is talking of the "essential characteristics" of measured space-time (p. 142 n.). About this "natural geometry" of the world I agree with Mr. Eddington against his critics: our experimental measures of length do not give us a Euclidean (or indeed a homaloidal) space-time, but do give us a non-Euclidean, non-homaloidal but still Riemannian space-time. And the nature of space-time can only be settled by experiment.

Mr. Eddington, however, has only himself to blame if he is misunderstood. True: he confines geometry to natural geometry and does not describe his world-building as geometrical. But he pretends to construct our actual space and time with it. And he speaks of geometry, having "swallowed up the whole of mechanics," as making "some tentative nibbles at electromagnetism" (p. 136), without disclosing the fact that the swallowing kind of geometry is entirely different from the nibbling kind. Moreover, he suggests (p. 142 n.) that natural geometry only applies in the absence of an electromagnetic field, thereby casting back to his and Weyl's original interpretation of the world-geometry of a general field in theory as being more than a graphical illustration.

One reason why this distinction is of importance is because Mr. Eddington's thesis that the laws of physics are mathematical identities is more interesting when applied to the law of gravitation in the "natural geometry" than when applied to the laws of electromagnetism in a "world-geometry". In this latter case I have argued that the logical status of the laws is exactly what it has always been; but I should not wish to deny that the advent of the theory of relativity has changed considerably the view which we ought to take as to the status of gravitation in the world. The difference between the two cases is, I think, as follows: In the case of electricity we have produced a system in which certain quantities obey Maxwell's equations. It is accordingly possible to identify these quantities with the electromagnetic quantities which also obey these equations, but it is not necessary to identify them in this way. And if we do not, we simply do not get any electromagnetic field of force in our system. But in the case of

gravitation the identification is necessary as well as possible, for it can be proved from the "natural geometry" that bodies will move in such a way as will appear to some one who attributes the wrong natural geometry to the world to require a field of force to account for their motion. This field of "force" is created, as it were, by our expecting space-time to be constituted differently; the correct field of force comes straight from the "natural geometry," and since gravitation is the only force of the right nature and quantity, it must be identified with this geometrically originated force. Electricity produces sparks as well as forces, and sparks cannot be produced by our mistaking the geometry. Gravitation produces only fields of force, and these can be produced (or, to be more accurate, their effects can be produced) by our mistaking the geometry. You can say, if you like, that relativity has abolished gravitational forces: there are no gravitational forces in reality any more than there are real centrifugal forces, but there are gravitational and centrifugal motions.

So if the "natural geometry" of the world is what it is, the law of gravitation is not a separate law. Nevertheless, one of our reasons for believing that the natural geometry is what it is, is that it is such that mistakes in it will give us gravitation. It is not only the measurement of intervals of space and time which makes us state that the natural geometry of the world is based on an interval which is a quadratic form of four dimensions, whose contracted Riemann-Christoffel tensor is a constant multiple of the coefficients of the quadratic form: it is also the fact that this assumption gives us ten quantities which must be identified with the ten gravitational potentials. But for gravitation we should be believing that space-time was Euclidean. "Mechanics in becoming geometry remains none the less mechanics" (p. 137): they are both experimental sciences.

According to Mr. Eddington, "the laws of Nature divide themselves into three classes: (1) identical laws, (2) statistical laws, (3) transcendental laws" (p. 244). Mr. Eddington's assertion that the first class "cannot be regarded as genuine laws of control of the basal material of the world" must be disputed on the ground that his "world building" has merely concealed the fundamental "transcendental" laws. And his belief that the statistical laws can stand on their own feet is, as I have shown, very doubtful. So, whether or not there are any laws of Nature which Mr. Eddington would not put into either the first or the second class, I do not believe

that "physics is no longer pledged to a scheme of deterministic law" (p. 294) since I believe that all the laws in these two classes are derived from the third class of law. There may be only one ultimate "genuine law of control of the physical world," but one there must be.

In his next chapter Mr. Eddington goes on to discuss the things with which physics is concerned and concludes that ultimately they are pointer readings. "The whole subject matter of exact science consists of pointer readings and similar indications" (p. 252). This would seem to accord ill with the process of "world building" from the most abstract relata; but the reconciliation comes about, I think, through the forces, material objects, electric charges, etc., with which we "identify" the abstract relata, being regarded as logical constructions from the pointer readings. Mr. Eddington, in discussing an elephant sliding down a hill, writes:—

"From the point of view of exact science the thing that really did descend the hill can only be described as a bundle of pointer readings. (It should be remembered that the hill also has been replaced by pointer readings, and the sliding down is no longer an active adventure but a functional relation of space and time measures.)" (p. 253).

It is important to note that Mr. Eddington's belief that physics is about pointer readings is based on epistemological considerations: "whenever we state the properties of a body in terms of physical quantities we are imparting knowledge as to the response of various metrical indicators to its presence, *and nothing more*" (p. 257: his italics); therefore physics can deal with nothing that cannot be logically constructed out of pointer readings. In spite of his disclaimer Mr. Eddington's approach to the subject is here similar to Dr. Whitehead's.

What then are these "pointer readings and similar indications," from which the world of physics is constructed? Mr. Eddington is most explicit in this passage: "The observation of approximate coincidence of the pointer with a scale-division can generally be extended to include the observation of any kind of coincidence—or, as it is usually expressed in the language of the general relativity theory, an intersection of world-lines" (p. 253). Now these are what are usually called "events": Mr. Eddington, like most modern writers who deal with the philosophy of nature, wishes to construct the world of physics out of events. Why Mr. Eddington is not as clear on this point as could be wished is because, in the interests of his metaphysic, he has to belittle his pointer readings. He contrasts knowledge of them with "knowledge of a much more intimate kind of the entities of the external world" (p. 258) and says that "though a world of symbolic



character can well be constructed from [a schedule of pointer readings], this is a mere shelving of the inquiry into the nature of the world of experience" (p. 281). But if the world of experience is a world of events (and Mr. Eddington admits this so far as physical knowledge is concerned), what more intimate knowledge can we have than our direct knowledge of events?

A clear recognition that the pointer readings are events—intersections of world-lines—with some of which we are acquainted would, I think, alter Mr. Eddington's view of the "cyclic method of physics". Mr. Eddington contends that definition in physics goes round in a circle: every term is defined by means of other terms which ultimately are defined with reference to the terms we have started with. For example, gravitational potential is defined in terms of intervals, which are "relations between pairs of events which can be measured with a scale or a clock or with both" (p. 261). Mr. Eddington then defines scales and clocks in terms of matter, matter in terms of mass, momentum and stress, and these three in terms of the gravitational potentials. But surely if events are the data of physics, scales and clocks (at least so far as physics is concerned) are "bundles" of events, and intervals, which are relations between events, do not require scales and clocks in their definition. [I should be inclined to say that an interval was a simple relation between two events and that we are sometimes directly aware of this interval. It is measured (not defined) by observing that each event is spatially and temporally contiguous with another event which is in a scale or a clock.] Then in terms of events we can define matter, and thus obtain by means of the intermediate notions of mass, momentum and stress a relation between matter and the gravitational potentials, which is Einstein's law of gravitation as a real law of governance in the world.

The data of physics, for Mr. Eddington, are pointer readings or events; and he is on this point in agreement with the various philosophies of nature based upon events that have been propounded in recent years by Alexander, Russell and at least two different Whiteheads. However, Mr. Eddington differs from all these philosophers in postulating noumena "of inscrutable nature" (p. 254) behind the events. Why he demands these is not made at all clear: I think it is because he can see no other way of getting the "light and shade" into the world. But why should not the "light and shade" be non-physical properties of the events or of constructs from the events? Calling an event a "pointer



reading" does not necessarily ensure its ethical neutrality. Physics would thus become a treatment of a selection of the properties in the world, not of a selection of the things. Mr. Eddington's half-hearted philosophy of events lays him open to all the criticisms that are usually made against such a philosophy (as, for example, in Mr. Joseph's and Mr. Dawes Hicks's articles) with none of the compensating advantages. He will talk of elephants as "bundles of pointer readings," and of people as "ridges in the four-dimensional world," and sees no difficulty in explaining the continuity of the world of physics by means of relations between events: "It is the connectivity of pointer readings, expressed by physical laws, which supplies the continuous background that any realistic problem demands" (p. 255). But his repeated assertions that physical science is concerned only with "a world of shadows" (p. xvii) will encourage his critics to demand "substances" less inscrutable than he is prepared to offer. It seems to me that, if Mr. Eddington had realised the point which Mr. Russell has been at great pains to make clear—that events can have properties which physics cannot study as well as properties which it can, he would have lost his main reason (and his desire) for distinguishing between the world of physics and the physical world. The valid distinction is between the scope of physics and the scope of, for example, religion.

#### (4) *Spiritual Reality.*

I do not propose to discuss Professor Eddington's theory that the "background" of the pointer readings consists of "mind-stuff," because I do not believe that his philosophy of nature requires a background at all. But it would give an unfair picture of the book if I were to omit all reference to the portions of the book dealing with religion. Unlike some Gifford Lecturers Mr. Eddington does not relegate God to a final chapter: the whole work is permeated by a sense of the spiritual nature of reality. Mr. Eddington's is a mystical religion ("I have no impulse to defend any other," p. 339); and if he attempts what he does not willingly attempt—"to put into words the essential truth revealed in the mystic experience . . .—that the harmony and beauty of the face of Nature is at root one with the gladness that transfigures the face of man" (p. 321), it is a profitless task to pick up his words and to ask him if he is convinced that he has correctly analysed his experience. For mystics speak in metaphors which appear to different persons obviously ap-

propriate or obviously inappropriate to the facts of experience; and no amount of argument will serve to reverse their appropriateness values. All that it is profitable to do is to criticise the language of the mystic and to suggest that he sometimes uses a metaphor which a reader (or the author himself) may be tempted to take too literally.

Take free-will, for example. Mr. Eddington claims that strict causality in the physical world has been replaced by statistical laws. Now, it is clear that if this were the only evidence for indeterminism of the will, it would only release our volitions individually to bind them as tightly when taken in the mass. As in the armies in *War and Peace*, the individual soldiers would only be able to move as they liked on the condition that the army as a whole followed its destined course. But Mr. Eddington also thinks that it is easier to permit the mind to interfere with statistical laws than to interfere with transcendental laws (if there are such laws), and so in order to get a will which is free in the long as well as the short run he supposes that "in the physical part of the brain immediately affected by a mental decision there is some kind of interdependence of behaviour of the atoms which is not present in inorganic matter" (p. 314). Now, supposing this proposition were proved to be untrue, supposing it were proved conclusively that the physics of a living brain were the same as the physics of inorganic matter, would this refutation have any bearing whatever on Mr. Eddington's experience (mystical, if you like) of free-will? I cannot believe that it would. In which case it seems to me improper to write as if that part of his experience which he speaks of as "freedom of the will" was the conclusion of an argument in which this proposition was a necessary premiss. A mystic is unassailable until he attempts to argue, and then he has given away his position. There can be no reasons in favour of mysticism.

I do not think that Mr. Eddington would disagree with me about this. Indeed in his admirable Swarthmore Lecture delivered to the Society of Friends in May of this year,<sup>1</sup> he seems to be explicitly disclaiming that defence of religion by science which might be read into the Gifford Lectures.

"It is probably true that the recent changes of scientific thought remove some of the obstacles to a reconciliation of religion with science; but this must be carefully distinguished from any proposal to base religion on scientific discovery. For my own part I am wholly opposed to any such attempt" (p. 45).

<sup>1</sup> *Science and the Unseen World*. By A. S. Eddington. London: George Allen & Unwin Ltd, 1929. Pp. 56. Cloth 2s. 6d. Paper 1s. 6d.

And of a causal explanation of the silence on Armistice Day, he writes: "Often the best way to turn aside an attack is to concede it." [He has already stated that he is prepared "to concede that even human actions are predictable by a—possibly enlarged—scheme of physical law".] "The more complete the scientific explanation of the silence the more irrelevant that explanation becomes to our experience" (p. 41). Science and mysticism may own the same territory, but they can never speak the same language. Just as mathematics or the baldest prose is the proper language for science, so one would wish to confine the language of religion to the most metaphorical poetry—were it not that this would be to destroy the rationale of the Gifford Foundation.

## II.—GENERAL PROPOSITIONS.

BY C. H. LANGFORD.

IT is my purpose, in this paper, to offer certain suggestions towards an analysis of general propositions—suggestions which are by no means sufficiently exhaustive to afford a complete account, right or wrong, of the propositions in question, but which are, I think, definite enough to be of some interest. There are several respects in which an account of general propositions of the kind I have in mind would differ from the account of these propositions given in *Principia Mathematica*, and among these points of difference the following is perhaps the most important. I shall try to show how, in constructing general propositions, we can replace elementary matrices, whose values are elementary propositions, by functions whose values are not propositions at all, but certain facts, which are non-general facts. My suggestions in this respect are based at the outset on two connected views which I understand Prof. G. E. Moore to be holding: one, which is a view concerning the analysis of so-called singular propositions of the kind " $x$  has  $f$ ," where  $f$  would be a generic character, to the effect that such propositions are logically equivalent to propositions of the kind " $x$  has some character of the kind  $f$ ," where a character of the kind  $f$  would be a non-generic character; and another, which is a view concerning facts of a certain class, which are held to be general facts, because each of them involves at least one generic constituent in such a way that the fact is merely one to the effect that there is something of that kind, and which are, further, held to be facts such that each of them is logically equivalent to a fact about a description of such a kind that it can apply only to non-general facts, to the effect that there is just one non-general fact to which the description does apply.<sup>1</sup> We shall begin with a consideration of these two views, and shall then go on to inquire what their bearing is on the analysis of general propositions.

<sup>1</sup> See *Proc. Arist. Soc.*, supplem. vol. iii., pp. 99 ff., and supplem. vol. vii., pp. 171 ff.

We have, in the first place, a view with regard to what are commonly called singular propositions, according to which these propositions are always either identical with or logically equivalent to general propositions. Consider, for example, the proposition about this green sense-datum, *s*, expressed by "*s* is green," and suppose that we are observing the fact that *s* is green. In this case, it is clear that the fact that *s* is green is by no means all that we are observing—nobody ever observed with regard to anything merely that it was green, or merely that it was coloured. At the least, when we perceive that *s* is green, we are perceiving, or seem to be perceiving, a fact about *s* and about an absolutely specific shade of green, to the effect that *s* has that absolutely specific shade; but in saying that *s* is green, we are merely expressing a fact to the effect that *s* has some character of the kind in question—some character, that is to say, of such a kind that anything that had a character of that kind would have to be green, and anything that had no character of that kind could not be green. It is, however, sometimes held, in opposition to what is here maintained, that when we say that *s* is green, we are really expressing the fact that *s* has that specific shade of green which we, in observing *s*, perceive it to have, or to appear to have. But that this view is certainly false may be seen, I think, from the following consideration, which is due to Prof. Moore. Whenever a thing is green, it is also true that it is coloured, and, of course, the specific shade of green that the thing has is identical with the specific shade of colour that it has; so that if, in asserting *s* to be green, we were expressing the fact about *s* and the specific shade of green in question to the effect that *s* has that shade, and if, similarly, in asserting *s* to be coloured, we were expressing the fact about the specific shade of colour in question to the effect that *s* has that shade, then what we should be expressing by "*s* is green" would be precisely what we should be expressing by "*s* is coloured"; and these expressions would not stand for two propositions, but one.<sup>1</sup> There is, then, a perfectly definite sense in which singular propositions of the sort we are considering are general: any proposition of this sort is, in effect, one with regard to an assigned thing and an assigned kind of character, to the effect that the thing has some character or other of that kind. And if we go on to include propositions like "*s* is not green," the analysis is, of course, precisely similar: "*s* is not green" is a proposition to

<sup>1</sup> Moreover, it is not easy to see how the occurrence of false propositions of the form "*x* has *f*" is to be accounted for on this view. Cf. F. P. Ramsey, *Proc. Arist. Soc.*, suppl. vol. vi., p. 18.

the effect that *s* lacks every character of the kind 'green,' or has no character of that kind. But whether we are to say that the fact that *s* is green is a general fact, or that it is merely equivalent to one, is not entirely clear; the answer to this question seems to depend upon whether "green" may itself sometimes name a character rather than a kind of characters, that is, whether we can say strictly, "*s* has greenness". If "green" may stand for a single character, then "*s* is green" ought, I think, to be said to express a fact which is not itself general; whereas, if it must always stand for a kind of character, then "*s* is green" must, it seems, be identical with "*s* has some character of the kind 'green,'" and not merely equivalent to it; for if "green" is never itself the name of a character, we shall have to represent the generic character which a thing has when it is green by writing "*x* is green," or "is green," which will then mean "having some character of the kind 'green'". And I am inclined to think that this latter is indeed the case, that is, that the only generic characters which occur are those like "having some character of the kind 'green,'" which involve kinds of characters as constituents; although, in what follows, I shall say merely that singular propositions are *in effect* general, meaning by this that they are equivalent to general propositions, and possibly identical with them.

But, now, if the fact that *s* is green is in effect a general fact, there must be a corresponding non-general fact. So far as I can see, we cannot express this non-general fact; but we can, of course, describe it uniquely, as we have already done several times, by saying that it is *the* fact about *s* and the specific character of the kind 'green' possessed by *s* to the effect that *s* possesses that character. If we attempt to transform this definite description into a proposition expressing the fact described, we shall get something like, "*s* possesses the specific character of the kind 'green,' which it does in fact possess," and this, aside from the implication that *s* has one and only one character of the kind 'green,' is a mere tautology. However, despite the circumstance that we have no way of expressing this non-general fact, there seems to be no reason for regarding it as being intrinsically inexpressible; but, fortunately, the question whether such facts could be expressed need not be considered here, because, as we shall see, the answer to this question does not affect in any way the analysis of general propositions to be suggested. Now, since the non-general fact corresponding to the fact that *s* is green can be described, the proposition "*s* is green" is equivalent to a proposition about that description, to the

effect that there is something to which the description applies ; whereas, "*s* is not green" is in effect a proposition about that same description to the effect that it applies to nothing whatever. We have, then, affirmative propositions, which demand the existence of corresponding non-general facts, and negative propositions, which deny the existence of such facts.

There are three points relative to the nature of the non-general facts corresponding to facts of the form "*x* has *f*" which we must consider. In the first place, the predicate of a non-general subject-predicate fact will be a non-generic character, and this character will be of the sort determined by the predicate of the general fact. There are, indeed, three entities in question here : the generic character, which is that of having some character or other of the kind *f* ; the kind *f*, which is a factor in this generic character ; and the non-generic character, which is of the kind *f*. Now, the relation of *f* to the non-generic character of the kind *f* is not that of characterisation, but that of genus to species ; so that we cannot say of the non-generic character that it has *f* ; it is a character of that kind. We do, however, sometimes speak as if this were a relation of characterisation : we say, "Orange is like yellow," which, taken strictly, could be true only if *orange* were orange, and *yellow* were yellow ; but what we seem to be really meaning in this case is something that we can express by saying, "Being orange entails being yellowish," or by saying, "Anything that was orange would be, in respect of colour, like a thing that was yellow"—this being the point, as I understand it, that Mr. Johnson is making when he says, in effect, that whereas saying "Plato is human" is equivalent to predicating the adjective human of Plato, when we say that red is a colour, we are saying that any proposition of the form "*x* is red" implies a corresponding proposition of the form "*x* is coloured".<sup>1</sup> Thus, the relation of the predicate of a non-general fact to the predicate of a corresponding general fact is that of entailing, and the non-general fact implies or necessitates the general one.

In the second place, it is to be noted that the character which is the predicate of the non-general fact corresponding to the fact that *s* is green is universal, not particular : any other sense-datum, *s'*, exactly similar to *s*, will be the subject of a fact whose predicate is this same non-generic character. It is sometimes held, on the contrary, that non-generic characters are abstract particulars, and thus that the fact about *s'* will involve a numerically distinct, though exactly similar,

<sup>1</sup> See his *Logic*, part i., pp. 176 ff.

character. This view is held by Prof. Stout, and Mr. Joseph, and by Prof. Cook Wilson, who holds that "the attributes of particulars are as particular as the subjects to which they belong, and the distinction of universal and particular applies as much to attributes as to subjects".<sup>1</sup> But when these philosophers say that the predicate of the fact about *s'* is distinct from, though exactly similar to, that of the corresponding fact about *s*, they seem to be thinking of the non-general facts themselves rather than the predicate of these facts. It is, of course, true that these facts are numerically distinct, because they have distinct subjects; it is true, also, that the facts are intrinsically indistinguishable, because the mere numerical difference of their subjects is the only respect in which they differ; and it is, perhaps, easy to confuse these facts, which are plainly two, with the character which is the predicate of each—especially since what we see, primarily, when we observe *s*, or *s'*, is neither the sense-datum nor the character, but the fact that the datum has the character, both the datum as distinguished from the character and the character as distinguished from the datum being products of analysis. This explanation of the occurrence of the view that non-generic characters are particulars is derived from what I take to be the explanation given by Mr. Ramsey, who holds, if I understand him rightly, that the view in question results from a confusion of facts like the fact that *s* is green with characters.<sup>2</sup> I am, then, simply suggesting that, in Mr. Ramsey's account, the general fact be replaced by the corresponding non-general one.

Finally, we must inquire in detail with regard to a point concerning precisely what the non-generic character characterising *s* involves. This character might, I think, be supposed to be simply an absolutely specific *shade* of green, of such a kind that, if *s* and *s'* had the same shade, and were uniformly coloured, but of different shapes and sizes, the non-generic character of the kind 'green' attaching to the one would be

<sup>1</sup> See, respectively, *Proc. Arist. Soc.*, supplem. vol. iii., p. 114; *ibid.*, supplem. vol. iv., pp. 8 ff.; and *Statement and Inference*, vol. i., p. 171. The view that characters are particulars I take to be one such that, if it is true, not only does no character in point of fact characterise more than one thing, but none can, in the nature of the case, characterise two or more things; that is to say, I take the view to be one according to which, from the fact that an assigned character characterised a given thing, it would follow that the character did not characterise anything else. And this is, of course, part at least of what ought to be meant by such a view; for the mere fact that a character happened to characterise one thing only would be no reason for holding it to be particular.

<sup>2</sup> *Loc. cit.*, pp. 18 ff.



identical with that attaching to the other. In such a case,  $s$  and  $s'$  would, in the language of Mr. Johnson, involve the same absolute determinate under the determinable 'colour'; and I have spoken above as if such a determinate character might be non-generic; but it seems to me doubtful, nevertheless, whether an absolute determinate, in Mr. Johnson's sense, is a non-generic character. We must, I think, distinguish between the shade of colour which a datum has and its specific colour or colouring. If a datum is made up of two halves, one green and the other blue, it has a determinate colouring, but not a determinate shade of colour; though, of course, parts of the datum may have determinate shades. But it seems to be quite possible that no part of a datum, however small, should really have a determinate shade of colour—as may be seen from the following consideration. Let us suppose that we have a datum which is green, but which varies continuously in colour throughout its extent, in such a way that no two parts of the datum can be said to have precisely the same colouring. More specifically, let us suppose that the variation with respect to colour is such that, if we take any point of the datum, and consider circles of different radii drawn with that point as center, the smaller the radius, the more nearly uniform in colour the area of the circle; and such that, for any assigned degree of uniformity in colour, less than complete uniformity, there exists a circle whose area varies in colour less than that amount; but such that no circle of the series has an area which is completely uniform in colour. Then, in such a case, as the series of smaller and smaller circles approaches the assigned point as a limit, the variation in colour of the areas of the successive circles will approach complete uniformity as a limit, and will thus approach an absolutely specific shade; so that we can, if we like, say that the colour of the datum at the assigned point is this specific shade which is approached, just as we say that the direction of a continuously curving line at a point on the line is the direction of the tangent to the line at that point. But, in fact, just as a point on a curve has no direction (so that nothing internal to the curve has the direction which we speak of as the direction of the curve at the point), so a point of the datum has no colour, since being coloured entails being extended; so that nothing internal to the datum has the specific shade in question. Nevertheless, the datum has an absolutely specific pattern of colour; and this pattern is universal, since there might be another exactly similar datum. It is to be noted, moreover, that another datum which should possess this same pattern would have to be of the same shape

and size as the first one; it would have to be of the same shape, because shape is an essential factor in the pattern; and since the second datum would have to involve the same variation in colour as the first, if it should be (say) smaller, that circumstance would necessitate a more rapid change in colour, and the pattern could not be the same. But, now, even where we have a datum that is uniform in colour, it is not clear that the specific shade that occurs is a non-generic character; for when we consider the fact with regard to the absolutely specific shade,  $\phi$ , which the datum has, to the effect that the datum has  $\phi$ , we see that this fact necessitates that the datum have *some* shape and *some* size, but does not necessitate a more specific fact with regard to the shape and size in question; so that the fact that the datum has  $\phi$  is still in effect general. That is to say, just as the fact that  $s$  is green is general because it implies that  $s$  has some character of the kind in question, and fails to imply a more specific fact with regard to the character of this kind that  $s$  does have, so the fact that  $s$  has  $\phi$  is general because, for one thing, it both implies a fact to the effect that  $s$  has some size, and fails to imply a more specific fact about the actual size of  $s$ . There would, of course, be no reason for holding  $\phi$  to be a generic character if the fact that  $s$  has  $\phi$  failed to necessitate the possession by  $s$  of any shape, or size, or the like, at all. Thus, I wish to hold that the non-general fact corresponding to the fact that  $s$  is green has a predicate of the following kind. Consider all the facts about  $s$  which are implied by the fact that  $s$  is green: " $s$  is green" implies that  $s$  is extended, that it has some shape, that it either has some determinate variation in colour or is uniform in colour, and other facts of this kind—but I will suppose that these are all. Then the predicate of the non-general fact will be one such that the fact that  $s$  has that predicate implies that it has a certain specific extension, a certain specific shape, and a certain specific variation in colour, or complete uniformity of colour. A character is non-generic if, and only if, when the predication of that character would imply that the thing of which it was predicated had a certain non-specific character, it would also imply that the thing had a certain corresponding specific character. When I perceive the sense-datum  $s$ , I seem to be perceiving that it has a character of precisely this kind; every determinable characteristic which  $s$  appears to me to have corresponds to some determinate characteristic which it appears to me to have; and there seems to be one complex character which characterises  $s$ , such that anything that had that character would, for that reason alone, have all these determinable and

determinate characteristics. Let us consider an example of a slightly different kind, where it might be supposed that we were really expressing a non-general fact. If I say of a datum that it is triangular, I am, of course, making an assertion which is general, because, for one thing, there are triangles of different sorts; but if I say of a datum that it is square, I am asserting a determinate characteristic under the determinable 'shape,' since squareness does not admit of further determination within that category. Nevertheless, when I say that the datum is square, I am saying in effect that it has some character of that kind, involving some specific size, some specific texture, etc. I think it worth observing, further, with regard to Mr. Johnson's determinates, that they, or some of them, are complex in the same sense as that in which I am saying non-generic characters are. Thus, with regard to colour, which Mr. Johnson holds to be a single determinable, we are told that "a colour may vary according to its hue, brightness, and saturation; so that the precise determination of a colour requires us to define three variables which are more or less independent of one another in their capacity of co-variation; but in one important sense they are not independent of one another, since they could not be manifested in isolation".<sup>1</sup> And so, whatever has a hue must have *some* saturation, whereas a specific saturation is not entailed by a specific hue; and this is exactly the relation in which colour stands to extension, although, as I understand Mr. Johnson, colour and extension are not factors in one determinable.

So far, we have considered only facts of the subject-predicate kind; but there seems to be no difficulty in extending what has been said to facts involving a relation among several terms. Let us consider facts involving dyadic relations. Here, for example, are two books, *a*, *b*, and we can say truly of *a* and *b* that *a* is in contact with *b*.<sup>2</sup> In this case, it is to be maintained, just as before, that the fact which we express by the words "*a* is in contact with *b*" is or is equivalent to a general fact, to the effect that *a* and *b* are in contact in some way or other; and that there is a corresponding non-general fact, with regard to *a* and *b* and the precise way in which they are in contact, to the effect that they are in contact in just that way. It is clear that when we say that *a* is in contact with *b*, we neither express nor attempt to express

<sup>1</sup> *Loc. cit.*, p. 183.

<sup>2</sup> I am supposing that we can make judgments which are directly about physical objects; there must, in any case, exist facts and propositions of the kind intended, and that is sufficient.

the precise way in which this contact is effected, but say simply that *a* and *b* have contact of some sort or other; whereas, the non-general fact which is in question when we make this judgment is one which is sufficient for the truth of the judgment, and also sufficient for the truth of other general judgments, namely, that *a* overlaps *b*, that *a* is near *b*, etc.

We have seen that a non-general fact corresponding to a general fact like the one expressed by "*s* is green" can be described, but apparently cannot be expressed; and we have now to inquire how such non-general facts are to be most appropriately described. Let us consider the fact corresponding to the general fact that *s* is green. The proposition "*s* is green" is logically equivalent to "*s* has some non-generic character of the kind 'green,'" and to "Some non-generic character of *s* is of the kind 'green,'" and to "A non-generic character of *s* of the kind 'green' exists," where "exists" is used in a sense appropriate to descriptions. With regard to this last formulation, it would commonly be said that the description "a non-generic character of *s* of the kind 'green'" would describe a certain character; but it is clear that this description could describe a character only by describing it as one related to *s* in a certain way; and thus it would seem that the description could describe the character only by describing also, though in a slightly different sense perhaps, a fact of which the character was a constituent. The description "a non-generic character of *s* of the kind 'green'" would, therefore, describe and apply to a non-general fact; and what we should be saying if we said "A non-generic character of *s* of the kind 'green' exists" would be simply that there was a fact to which this description applied.<sup>1</sup> Now, I think that descriptive expressions such as "the greenness of *s*," which are similar to the ones we are considering, are employed very often in common usage for the purpose of denoting non-general facts; but it seems that they are generally ambiguous. Thus, McTaggart tells us that "the squareness of the table is a fact"; and here he means, of course, that the *squareness of the table* is a fact, not that the *squareness* is, the ambiguity depending upon what the word "the" is to be understood to apply to.<sup>2</sup> Still, it is not clear whether he means this as a description of the general fact that the table is square, or as a description of the correspond-

<sup>1</sup> Note that the expressions "a non-generic character . . ." and "the non-generic character . . ." are equivalent in this connexion, since there cannot, in the nature of the case, be more than one such character.

<sup>2</sup> *The Nature of Existence*, vol. i, p. 11.

ing non-general fact; and I think it will be better to avoid all such expressions, since even when they are not ambiguous as between a general and a non-general fact, they may be so as between a fact and a character. We can, I think, obtain a description which describes unambiguously the non-general fact corresponding to the fact that  $s$  is green in the following way. Let us express the general fact by writing " $s$  is characterised by a non-generic character of the kind 'green,'" and let us remove *is* from this expression, so that we have " $s$  characterised by a non-generic character of the kind 'green' ". This latter expression does, it seems, express a description which applies to the corresponding non-general fact; when we insert *is*, we are saying simply that there exists a fact to which the description applies; so that we can say as well, " $s$  characterised by a character of the kind 'green' exists," which expresses, even more explicitly than the first expression, a proposition about the description, to the effect that there is something to which the description applies. In the same way, from " $a$  is in contact with  $b$ ," we can derive " $a$  in contact with  $b$ ," which describes and applies to the corresponding non-general fact; and then we can say, " $a$  in contact with  $b$  exists," which is true if, and only if, there is a fact to which this description applies. And similarly, " $a$  is not in contact with  $b$ " is to be written, " $a$  in contact with  $b$  does not exist".

As a matter of notation, we may replace the expression " $s$  characterised by a character of the kind 'green'" by " $g(s)$ ," so that we can express a proposition to the effect that  $g(s)$  applies to some fact by writing " $g(s)$  exists"; and we may replace the expression " $a$  in contact with  $b$ " by " $c(a, b)$ ," so that a proposition to the effect that  $a$  is in contact with  $b$  can be expressed by " $c(a, b)$  exists". Now we have many descriptions,  $g(s)$ ,  $g(s')$ , . . . , which differ among themselves only in respect of the individuals which they involve; and we may denote what is denoted by any such description by  $g(x)$ , where  $x$  is a variable taking individuals as values (and in the same way, we may, of course, write  $c(x, y)$ , where  $x$  and  $y$  are variables).  $g(x)$  is a description involving two generic constituents,  $g$  and  $x$ ; unlike  $g(s)$ , it is one which applies to many different facts—in particular, to any fact corresponding to a general fact expressed by a proposition of the form " $x$  is green".

Let us consider now the usual formulation of general propositions, and compare that formulation with the one here suggested. We shall be confined for the present to propositions which involve a single generalisation—*i.e.*, to

singly-general propositions. Such propositions are constructed, according to the ordinary procedure, on propositional functions, a propositional function being a description which describes and applies to propositions. Thus, when we wish to render the proposition "Something is green," we do so by asserting that the function " $x$  is green" has an instance which is true, where, of course, the clause "which is true" is essential, since " $x$  is green," being a propositional function, is susceptible of values that are false. On the other hand, according to the procedure I am suggesting, we replace the expression " $x$  is green," which applies to propositions, by the expression " $g(x)$ ," which applies to facts; so that we can replace "There are true values of ' $x$  is green'" by " $g(x)$  exists". In the same way, in rendering the proposition "Something is in contact with something," we write " $c(x, y)$  exists" in place of "There are true values of ' $x$  is in contact with  $y$ '". And just as, in the notation of *Principia Mathematica*, we write " $(\exists x). x$  is green" and " $(\exists x, y). x$  is in contact with  $y$ ," so we may write " $\exists g(x)$ " and " $\exists c(x, y)$ ," where, however, the prefix " $\exists$ " is applied to the functions in question rather than to variables in these functions; and, of course, in place of the universal proposition " $\neg (\exists x). x$  is green," we shall have " $\neg \{ \exists g(x) \}$ ". But according to the analysis we are considering, ordinary singular propositions are in effect general; so that we shall have many propositions, such as  $\exists g(s)$  and  $\exists c(a, b)$ , which do not occur as general propositions in the ordinary analysis.

There is one point in particular, with regard to functions like  $g(x)$ , which I wish to make. It is to be observed that  $g$  is a variable, since it denotes many different characters of a certain kind. Now this means that we shall have functions involving the independent variables  $g, g', \dots$ , which denote entities of the same kind, and which may take the same or different values, just as we have the independent variables  $x, y, \dots$ , denoting individuals, and taking the same or different values. Thus, if we write  $g(x).g(y)$ , we have a function in two independent variables of the same kind,  $x, y$ ; but, as this function is written, there are two occurrences of the one variable  $g$ , just as there would have been two occurrences of the one variable  $x$  if we had written  $g(x).g(x)$ . If this point were not noted, we should, perhaps, be inclined to suppose " $g(x).g(y)$  exists" to be logically equivalent to "There are true values of the propositional function ' $x$  is green and  $y$  is green'"; whereas, in fact, " $g(x).g(y)$  exists" expresses a proposition which cannot be expressed by means of propositional functions at all; for it

says that  $x$  and  $y$  have one and the same character of the kind 'green,' which may, of course, never happen, in the case of distinct individuals, but which is nevertheless logically possible. In the same way, we have the independent variables  $c, c', \dots$ , and if we wish to say that  $a$  is in contact with  $b$ , and  $a'$  in contact with  $b'$ , but wish to avoid saying that the contact is effected in the same way in the two cases, we shall have to write " $c(a, b). c'(a', b')$  exists".

We must now direct attention to a limitation of the analysis of propositions so far suggested, and must endeavour to extend this analysis so as to remove the limitation in question. We are saying that a singly-general proposition is one with regard to a function, to the effect that the function has an application, or does not have an application—a proposition of the first sort being affirmative, or particular, and one of the second sort being negative, or universal. We are saying, moreover, that the function in question is one that applies to facts of a certain kind, if it applies to anything at all; but the conception of general propositions as being propositions about functions, to the effect that the functions do or do not have instances, does not seem really to demand that the functions in question be such as to apply to facts. Thus, it is sometimes said that the proposition "Something is green" is to be rendered, "Greenness has application"; and here the view seems to be that the proposition is one with regard to a property applicable to things, to the effect that there are things to which the property applies. But I think that it is perhaps not always clear to those who suggest this account that the view they are suggesting does not, as it stands, enable us to deal with propositions involving more than one generalisation. It seems clear that any singly-general particular proposition is equivalent to a proposition of the form " $f$  has application," and that any singly-general universal proposition is equivalent to one of the form " $f$  lacks application"; but it is not immediately obvious how this formulation is to be extended to multiply-general propositions. Thus, we can express the singly-general proposition " $(\exists x, y). x$  is in contact with  $y$ ," i.e., "Something is in contact with something," by saying "Contact has application"; but neither the proposition " $(x): (\exists y). x$  is in contact with  $y$ ," i.e., "Everything is in contact with something," nor the proposition " $(\exists x): (y). x$  is in contact with  $y$ ," i.e., "Something is in contact with everything," seems to be expressible in this way. Now the difficulty here, connected with interpreting propositions of a degree of generality higher than the first in terms of properties applicable to things, arises also in

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connexion with any attempt to interpret these propositions in terms of functions applicable to facts; and what I want to do is to raise the question how, if at all, this latter interpretation can be carried out. It would, indeed, seem to be possible to avoid this question altogether, by falling back on the usual formulation of general propositions, and admitting propositional functions. We might, for instance, express the proposition "Everything is green," which is ordinarily written " $(x). x$  is green," by writing " $(x): (\exists g). x$  has  $g$ ," where  $g$  is, as elsewhere, a variable whose values are non-generic characters. But to do this would be to give up certain points that I want to make; for my aim is to show how elementary propositions can be dispensed with, and to exhibit some of the formal properties of general propositions which result when this is done.

In dealing with the question how multiply-general propositions are to be formulated in terms of functions applicable to facts, however, we shall begin by considering certain points connected with the construction of propositions on propositional functions of the usual kind; we shall then be able to see how these same considerations apply in the case of the functions with which we are immediately concerned. According to the usual theory of general propositions, we have, in the simplest case, a function of the form  $f(x)$ , where  $f$  is constant, and we say, with regard to this function, either that there is a value of  $x$  giving rise to a true proposition or that there is no such value. But it is to be noted that we can say equally well that there is a true value of  $f(x)$ , or that there is no true value, and that, in so doing, we are generalising the entire function rather than a variable constituent of the function. The two propositions in question here are commonly written  $(\exists x). f(x)$  and  $\neg (\exists x). f(x)$ , where generalisation is expressed with respect to the variable  $x$ ; whereas we can, on the other hand, express generalisation with respect to the entire function in these cases by writing  $(\exists f x). f(x)$  and  $\neg (\exists f x). f(x)$ . Now, if we have a function in two variables,  $f(x, y)$ , where  $f$  is constant, we are able, as we have seen, to assert such propositions as "Every value of  $x$  is such that for some value of  $y$ ,  $f(x, y)$  is true" and "Some value of  $y$  is such that for every value of  $x$ ,  $f(x, y)$  is true," these propositions being written  $(x): (\exists y). f(x, y)$  and  $(\exists y): (x). f(x, y)$  respectively. And with regard to a proposition such as either of these, it is to be noted that the prefix of the proposition involves two distinct factors: the order of generalisation, determining what is called the 'scope' of a generalised variable, and the way in which the variable is generalised,



universally or particularly. It is possible to separate these two factors; for the scopes of the variables in a function simply indicate the order in which the variables are to take values, and we can indicate this order without indicating whether an assigned variable is to be universal or particular. Let us do this by the use of subscripts attached to the variables in the function, in such a way that the variable or variables with the highest subscript are to take values first, and those with the lowest subscript, last. In accordance with this convention,  $f(x_1, y_0)$  is a function whose values are functions of the form  $f(a, y_0)$ , which arise from the assignment of values to  $x$ , whereas  $f(x_0, y_1)$  has values of the form  $f(x_0, b)$ , resulting from the assignment of values to  $y$ , while  $f(x_0, y_0)$  has values which are propositions of the form  $f(a, b)$ , resulting from the assignment of values to both  $x$  and  $y$ ; and it is to be noted that functions of the forms  $f(a, y_0)$  and  $f(x_0, b)$ , in turn, have propositions of the form  $f(a, b)$  as values. Now we can say, " $f(x_1, y_0)$  has application," which means simply that there is a function,  $f(a, y_0)$ , which is a value of  $f(x_1, y_0)$ ; so that it is quite possible to have propositions which are concerned, not with functions applicable to facts, but solely with functions applicable to other functions. And we can say, " $f(x_1, y_0)$  has an application which has an application"; but this statement is not equivalent to "Some value of  $x$  is such that for some value of  $y$ ,  $f(x, y)$  is true"; we shall have to say, " $f(x_1, y_0)$  has an application which has an application which is true," since the values of  $f(x_1, y_0)$  apply to false propositions as well as to true ones. Let us replace " $f(x_1, y_0)$  applies to some function" by " $\exists f(x_1, y_0)$ ," and " $f(x_0, y_0)$  applies to some proposition" by " $\exists f(x_0, y_0)$ "; and let us replace " $f(x_1, y_0)$  applies to some function which applies to some proposition" by " $(\exists f(x_1, y_0)) : (\exists f(x_0, y_0))$ ," and " $f(x_1, y_0)$  applies to some function which applies to some proposition which is true" by " $(\exists f(x_1, y_0)) : (\exists f(x_0, y_0)) \cdot f(x, y)$ ". Then, if, in accordance with the notation of *Principia Mathematica*, " $\neg (\exists f(x_1, y_0)) : \neg (\exists f(x_0, y_0))$ " is replaced by " $(f(x_1, y_0)) : (\exists f(x_0, y_0))$ ," we can write the proposition  $(x) : (\exists y) \cdot f(x, y)$  in the form

$$(f(x_1, y_0)) : (\exists f(x_0, y_0)) \cdot f(x, y),$$

where each generalisation applies to an entire function rather than to a variable constituent of a function. We are able, in this way, to express any general proposition which involves a single complex prefix applied to a matrix as an assertion with regard to a function to the effect that the function has, or does not have, an instance . . . which has, or does not have,

an instance which is true, where the last function of the series applies to propositions. Of course, I am not suggesting that the elaborate notation employed here be adopted in place of the notation which is in ordinary use; but I do wish to suggest that it be regarded as giving the full meaning of the usual notation—that generalisation be held to be always really applied to functions rather than to variables. When we employ the usual symbolism, subscripts are, of course, unnecessary, since the position of a variable in the prefix of a proposition indicates the subscript to be attributed to the variable.

Now, as with functions applicable to propositions, so in the case of those applicable to facts, we are able to form a denotative hierarchy, in which the subscript attaching to a variable determines the place in the hierarchy at which the variable takes values. Let us take, for instance, the function “ $x$  in contact with  $y$ ,” which we are writing  $c(x, y)$ , where  $c, x, y$  are variables. We may understand  $c_0(x_0, y_0)$  as denoting facts directly, whereas  $c_0(x_1, y_1)$  is to be understood as denoting functions such as  $c_0(a, b)$ , which in turn denote facts, while  $c_0(x_2, y_1)$  denotes  $c_0(a, y_1)$ , which denotes  $c_0(a, b)$ , which denotes facts; and, with regard to this notation, it is clear that we can omit the highest subscript or subscripts in a function without incurring ambiguity, so that, for instance,  $c_0(x_2, y_1)$  becomes  $c_0(x, y_1)$ , and  $c_0(x_0, y_0)$  becomes  $c(x, y)$ . If now we write  $\mathbb{H}c(x, y)$ , we are asserting that there is a fact of a certain kind, namely the kind ‘ $c(x, y)$ ,’ whereas if we write  $\mathbb{H}c_0(x, y)$ , where  $x$  and  $y$  take values while  $c$  remains variable, we are asserting that there is a function of a certain kind, of which  $c(a, b)$  is an example. Again, we can say, “ $c_0(x, y_1)$  does not have an instance which lacks an instance which has an instance,” this statement being equivalent to “ $(x): (\mathbb{H}y). x$  is in contact with  $y$ ,” i.e., to “Everything is in contact with something or other”. We may express this proposition by writing

$$\neg(\mathbb{H}c_0(x, y_1)) : \neg(\mathbb{H}c_0(x_1, y_1)) \cdot (\mathbb{H}c_0(x_0, y_0));$$

though this cumbersome expression may be immediately shortened to

$$(x): (\mathbb{H}y) \cdot (\mathbb{H}c(x, y));$$

and this, again, may be changed to

$$(x): \cdot (\mathbb{H}y): (\mathbb{H}c) \cdot c(x, y);$$

but in this last expression, we must, of course, avoid confusing  $c(x, y)$  with a propositional function. In this way, we are able to express a multiply-general proposition as an assertion with regard to a function to the effect that the function does, or

does not, have an instance which does, or does not, have an instance, etc., where the last function of the series applies to facts, and each of the others to functions of an order just lower than itself. Here the formulation obtained differs from the one arrived at above, in connexion with propositional functions, in that the statement does not end with the words "which is true". We are thus able to express certain general propositions in terms of the notion of 'having an instance,' and its denial, alone; and this may, I think, be taken to be a theoretical advantage.

We may now observe how propositional functions arise in connexion with the propositions under consideration. Since all the propositions with which we are concerned are general, all propositional functions will involve generalisation, *i.e.*, will be general functions, whose values are general propositions. If we take the proposition  $(x) : (\exists y) : (\exists c) . c(x, y)$ , and remove the generalisation which affects the variable  $x$ , so that we have  $(\exists y) : (\exists c) . c(x, y)$ ,  $x$  will be a free variable, and the resulting function will give rise to a proposition when a value is assigned to  $x$ . Again, the function " $x$  is green," which is commonly thought of as an elementary function, is to be expressed by the general function  $(\exists g) . g(x)$ , and the function " $x$  is in contact with  $y$ " is to be expressed, similarly, by  $(\exists c) . c(x, y)$ . Now, we have not only general functions whose values are propositions, but also others whose values are general functions; for if, for example, we write  $(\exists c) . c(x_1, y_0)$ , where the subscripts indicate, as elsewhere, that a value of the function is to be obtained by the assignment of a value to  $x$ , we have a function which takes functions of the form  $(\exists c) . c(a, y)$  as values.

So far, no attempt has been made to deal with elementary functions of functions denoting non-general facts, that is, with functions constructed in terms of *and*, *not*, and *or*. We must now inquire what status is to be assigned to these functions. It seems clear, in the first place, that the conjunction of any two non-general facts is itself a non-general fact, and thus that we may construct such functions as  $c(x, y) . g(x)$  and  $g(a) . g(b)$ , which denote facts directly. And if this is the case, then we can form a hierarchy of conjunctive functions, like the one formed in connexion with simple relational functions, and can construct corresponding general propositions; we can, for example, write  $c_0(x_2, y_1) . g_0(x_2)$ , which has as a value  $c_0(a, y_1) . g_0(a)$ , which has as a value  $c_0(a, b) . g_0(a)$ , which applies, or does not apply, to a fact. And it is, of course, possible to join two propositions, or two propositional functions, conjunctively; it is, for instance, possible to write

$(\mathcal{H}c, x, y) \cdot c(x, y) : \neg (\mathcal{H}g, x) \cdot g(x)$ , and  $(\mathcal{H}c) \cdot c(x, y) : \neg (\mathcal{H}g) \cdot g(x)$ . Thus, conjunction has all the properties that it might be expected to have. But when we come to negation, the situation seems to be peculiar. Although we have  $\neg \{(\mathcal{H}g(a))\}$  as a significant expression, we cannot, so far as I can see, express anything by  $\neg g(a)$ ; that is to say, it is only propositions and propositional functions that can be affected by negation; and if we wish to say of  $a$  that it has no character of the kind 'green,' we shall have to do so simply by denying the proposition " $a$  characterised by a character of the kind 'green' exists". Thus, there is only one prefix which can be attached to a function that is not propositional, namely " $\mathcal{H}$ ," though when this prefix is attached, the resulting expression may be affected by " $\neg$ ". Of course, in place of  $\neg (\mathcal{H}g) \cdot g(a)$ , and as a matter of purely verbal definition, we can, if we like, write  $(g) \cdot \neg g(a)$ , just as we write  $(x) : (\mathcal{H}g) \cdot g(x)$  in place of  $\neg (\mathcal{H}x) : \neg (\mathcal{H}g) \cdot g(x)$ ; but we cannot write  $(\mathcal{H}g) \cdot \neg g(a)$ , because this expression does not involve a situation in which " $\neg$ " can be interpreted as really applying to a function affected by " $\mathcal{H}$ ". Turning now to disjunctive functions, we find restrictions of precisely the same sort to be necessary. All the disjunctive facts with which we are concerned are general, so that we have no function which can be expressed by an expression of the form  $g(x) \vee c(x, y)$ ; but we do have  $(\mathcal{H}g) \cdot g(x) \cdot \vee \cdot \neg (\mathcal{H}g) \cdot g(x)$ , which is a disjunctive function of two propositional functions, as well as  $(\mathcal{H}g) \cdot g(a) \cdot \vee \cdot \neg (\mathcal{H}g) \cdot g(a)$ , which is a disjunctive function of two propositions, and  $(\mathcal{H}g) \cdot g(x) \cdot \vee \cdot \neg (\mathcal{H}g) \cdot g(a)$ , which is a disjunctive function of a propositional function and a proposition; and each of these functions may, of course, be affected by " $\neg$ ," so that we may write  $\neg \{(\mathcal{H}g) \cdot g(x) \cdot \vee \cdot \neg (\mathcal{H}g) \cdot g(x)\}$ , which is equivalent to  $\neg (\mathcal{H}g) \cdot g(x) : (\mathcal{H}g) \cdot g(x)$ .<sup>1</sup>

I wish now to consider briefly several different sorts of propositions which we must distinguish, and to point out how these propositions are to be constructed in connexion with the propositional and non-propositional functions with which we are concerned. It is well known that a proposition may be such that it can be certified as being true, or as being false, solely in virtue of the nature of some logical function which it involves; and I think it is easy to see, in view of the foregoing considerations, that the logical function

<sup>1</sup> It was suggested above that functions applicable to facts might be replaced by propositional functions, in such a way that, for instance, " $g(x)$  exists" would become "For some  $x$  and some  $g$ ,  $x$  has  $g$ ". Clearly, if that procedure were adopted, negation and disjunction would have all their usual properties.

in question in such a case must usually be a propositional function, rather than a function applicable to facts or to other functions that are not propositional. Let us take an illustration of the simplest sort:  $f(x) \vee \neg f(x)$  is such that, from the fact that a proposition was an instance of this function, it would follow that the proposition was true. This is a logical truth, which can be established by an examination of the function alone; and it is clear that  $f(x)$  must, in this instance, denote propositions, since disjunction and negation can occur only in connexion with propositions and propositional functions; though, of course,  $f(x)$  may denote propositions which are constructed on functions that are not propositional. All propositions of this kind are such that they can be known *a priori*; they are propositions in intension. There is, moreover, another large class of propositions in intension: just as from the fact that a proposition was an instance of  $f(x) \vee \neg f(x)$ , it would follow that the proposition was true, so from the fact that a proposition was an instance of  $f(x)$ , it would *not* follow that the proposition was true; and this latter is equally such that it can be certified by reference to the function in question alone. We may express the first of these propositions by writing  $\vdash f(x) \vee \neg f(x)$ , and the second by writing  $\neg \vdash f(x)$ , where " $\vdash$ " and " $\neg \vdash$ " simply replace the longer expressions. Now, to  $\vdash f(x) \vee \neg f(x)$  there corresponds the extensional proposition "All values of  $f(x) \vee \neg f(x)$  are in fact true," which may be written  $(f, x). f(x) \vee \neg f(x)$ , this proposition in extension being a logical consequence of the one in intension. On the other hand,  $\neg \vdash f(x)$  does not entail a corresponding proposition in extension; it is compatible both with  $(f, x). f(x)$  and with  $(\neg f, x). \neg f(x)$ . So long as we are dealing with propositional functions, propositions in intension can be formulated in the manner here indicated; but when we come to functions applicable to facts, this formulation is not possible. Thus, although we can express the fact that  $(\neg f). g(x)$  is a contingent function by saying that from the fact that a proposition was an instance of  $(\neg f). g(x)$ , it would not follow that the proposition was true, and would not follow that it was false, we cannot make a similar assertion about  $g(x)$ , though it is plainly contingent. We shall apparently have to say in this case that it is both logically possible that there should be a fact to which  $g(x)$  applies and logically possible that there should be no such fact.

The propositions with which we have been concerned up to this point are nearly all constructed on functions like  $g(x)$  and  $c(x, y)$ ; and it is to be noted that all such functions involve

so-called "material" constituents, since  $g$  and  $c$  are not logical variables. We must now inquire how functions involving nothing but purely logical factors are to be constructed. Let us replace " $x$  characterised by a character of the kind 'red'" by  $r(x)$ , so that we shall have variables  $r, r', \dots$ , analogous to  $g, g', \dots$ ; and let us denote what is denoted by  $g(x), r(x), \dots$  by  $\phi(x)$ , where  $\phi$  is a variable denoting any non-generic character. The characters denoted by  $\phi$  fall into different kinds, so that we shall have  $\phi, \phi', \dots$  standing for independent variables denoting characters of some one kind, whatever that kind may be. Let us write, also,  $\psi(x)$ , where  $\psi$  denotes characters, so that we shall have  $\psi, \psi', \dots$  denoting characters of one kind, which may or may not be the same as the kind to which the characters denoted by  $\phi, \phi', \dots$  belong. If, now, we write " $\phi(x) \cdot \phi(y)$  exists," we are saying that  $x$  and  $y$  have some one and the same non-generic character; if we write " $\phi(x) \cdot \phi'(y)$  exists," we are saying that  $x$  and  $y$  have characters belonging to some one kind; whereas, if we write " $\phi(x) \cdot \psi(y)$  exists," we are saying that they have characters belonging to the same kind or to different kinds. In the same way, we may replace  $c(x, y)$  by the more general function  $\phi(x, y)$ , so that we shall have many different functions,  $\phi(x, y), \phi'(x, y), \dots$ , all denoting dyadic-relational facts of one kind; and then we may write  $\psi(x, y), \psi'(x, y), \dots$ . Thus, the variables with which we are concerned denote entities of many different classes; and these classes may be related in various ways: if  $\phi$  denotes characters of the kind 'green,' and  $\psi$  characters of the kind 'red,' the ranges of the two variables have no common part, but if  $\psi$  denotes characters of the kind 'round,' they do have a common part, whereas, if  $\psi$  denotes characters of the kind 'colour,' the range of  $\psi$  includes that of  $\phi$ . In the statement of general propositions, it cannot be assumed that  $\phi$  and  $\psi$  will be such that their ranges of variation overlap; but an hypothesis to that effect may always be introduced (if  $\phi$  and  $\psi$  both denote characters, or both dyadic relations, etc.); or we may have an hypothesis to the effect that the range of  $\psi$  includes that of  $\phi$ ; or one to the effect that the two ranges coincide, in which case we write  $\phi'$  in place of  $\psi$ , just as we write  $\phi$  in place of  $\psi$  when we wish to impose the condition that they shall denote the same entity.

Now, we can replace  $\phi(x)$  by the more general function  $f(\phi, x)$ , which will denote what is denoted by  $\phi(x)$  as well as what is denoted by such conjunctive functions as  $\phi(a) \cdot \phi(x)$ ; and in the same way, we can, for example, introduce  $f(\phi, \psi, x)$ , which will denote what is denoted by  $\phi(a) \cdot \psi(x), \phi(x) \cdot \psi(x)$ ,

etc. But in connexion with these more general functions, there seems to be no reason why  $\phi$  and similar variables should be confined to denoting characters, or to denoting dyadic relations; for it seems clear that any true proposition about  $f(\phi, x)$  with which we may be concerned will remain true if  $\phi$  is taken to denote both characters and relations; and I wish to suggest that  $f(\phi, x)$  be understood in this sense, as denoting what is denoted by  $\phi(x, a)$ ,  $\phi(x, x, a)$ , etc., as well as what is denoted by such functions as  $\phi(x)$  and  $\phi(a) \cdot \phi(x)$ . Functions like  $f(\phi, x)$  would, I think, commonly be said to involve nothing but purely logical factors; but it seems doubtful, nevertheless, whether we ought to include them in a purely formal analysis, because  $f(\phi, x)$  involves the variable  $x$ , which is restricted to one particular kind of entities; and there seems to be no reason why such a restriction should be maintained, since no loss of formal properties is entailed when it is removed. We have seen that  $x, y, \dots$  are analogous to  $g, g', \dots$ , and to  $c, c', \dots$ ; and it seems clear that if we are to replace  $g$  by  $\phi$ , we ought to replace  $x$  by a generalised variable also. Let us see, then, whether  $f(\phi, x)$  cannot be replaced by a function  $f(t, u)$  which shall denote any non-general fact that can be analysed into two constituents and the remainder of the fact, whatever these constituents may be. If this is possible,  $f(t, u)$  will denote all facts denoted by  $f(\phi, x)$  and many others as well. But we must consider in this connexion an objection that will very likely be raised both against this generalisation and against the one just introduced, in accordance with which we are allowing  $\phi$  to denote relations as well as characters. It may be said, namely, that a variable must have a determinate range of variation, and that, in virtue of differences of type, no variable can denote both individuals and characters, and none both characters and relations. I think that this objection is invalid; it is true that a function must have a pre-assigned range of application, but I wish to hold that no such restriction applies to the variables in a function. Let us examine this point in detail.

Whenever we construct a function, its range of values must form a definite class; that is to say, we must always be able to decide whether an assigned entity is or is not a value of the function. Now there is a principle adhered to in *Principia Mathematica*, according to which, if we have a function  $f(x, y)$ , such that  $f(a, b)$  and  $f(a', b')$  are values of the function, then  $f(a, b')$  must be a value. Consider, however, the expression  $(x) : (y) \cdot f(x, y)$ , and render this expression in two ways: (1) "For every value of  $x$ , every value of  $y$  is such that



$f(x, y)$  is true," and (2) "It is false that there is a value of  $x$  such that there is a value of  $y$  such that  $f(x, y)$  is false".<sup>1</sup> These formulations are certainly not equivalent; for if there were values of  $x$  and  $y$  such that  $f(x, y)$  was non-significant, it would follow from that fact alone that (1) was false, but not that (2) was false; in asserting (2), all that we are asserting is a proposition to the effect that no value of  $f(x_1, y_0)$  has a value which is false. Since a function has a determinate range of application, the variables in the function have their values determined by the values of the function; if, in  $f(x, y)$ , we assign a value to  $x$ , there will then be a class of values that  $y$  can take with that value of  $x$ , this class being determined by the values of  $f(x, y)$  in which that value of  $x$  occurs, whereas, for another value of  $x$ , there may be a different class of values that  $y$  can take. We must, therefore, distinguish between the values that  $y$  can take in connexion with some value or other of  $x$  and those that it can take in connexion with an assigned value. And if, in place of saying "For every  $x, y, f(x, y)$  is true," we say "It is false that  $x$  and  $y$  exist such that  $f(x, y)$  is false," or better still, "There is no instance of  $f(x, y)$  which is false," it does not in the least matter whether there are values that  $y$  can take in conjunction with some values of  $x$  and not in conjunction with others.

Let  $f(\phi, x)$  be a function applicable to facts, and consider, for instance, the proposition

$$(f) :: (\exists \phi) : (x) . f(\phi, x) : \supset : (x) : (\exists \phi) . f(\phi, x),$$

which is constructed on this function. The two variables  $\phi$  and  $x$  have non-overlapping ranges of variation, but that circumstance is not essential to the truth of the proposition. Moreover, we can derive an analogous proposition by interchanging  $\phi$  and  $x$ , and another by replacing  $x$  by  $\psi$ , and a still more restricted one by replacing  $x$  by  $\phi$ . So that if we replace  $f(\phi, x)$  by  $f(t, u)$ , where  $t$  and  $u$  are variables that can denote individuals, characters, or relations, the resulting proposition will be true, and will be such that each of these more restricted propositions is a logical consequence of it, got by the substitution of variables of more restricted range for  $t$  and  $u$ . The function  $f(t, u)$  simply indicates a mode of analysis of a fact, and denotes any fact which admits of that analysis. Now there are other propositions about  $f(\phi, x)$

<sup>1</sup> I am supposing here that  $f(x, y)$  is a propositional function, in which  $f$  is constant; but we might equally well replace " $f(x, y)$  is true" by " $f(x, y)$  applies to some fact," and " $f(x, y)$  is false" by " $f(x, y)$  does not apply to a fact," the function being taken to be one applicable to facts, with  $f$  variable.



which depend upon the fact that  $\phi$  and  $x$  have distinct ranges of variation, and we may formulate corresponding propositions on  $f(t, u)$  by imposing the condition that  $t$  and  $u$  shall have distinct ranges; there are, similarly, other propositions about  $f(\phi, \phi')$  which depend upon the fact that  $\phi$  and  $\phi'$  have the same range, and we may formulate propositions on  $f(t, u)$  accordingly; but it is to be noted that no proposition depends upon the fact that  $\phi$  denotes properties and relations, and none depends upon the fact that  $x$  denotes individuals; so that we lose generality, and gain nothing, by employing  $f(\phi, x)$  and similar functions in place of  $f(t, u)$ .

### III.—THE BASIS OF KNOWLEDGE IN DESCARTES (II.).

BY A. K. STOUT.

THE first part of this article was concerned to show that the general rule "what is clearly and distinctly perceived is true," supposed to be inferred from the *Cogito* and confirmed by God's veracity, does not occupy the place in Descartes' epistemology which is commonly assigned to it. Each clear and distinct perception is self-evident, and needs no rule to guarantee it. The general rule plays a subordinate part, but one which is still essential to the ordered system of knowledge we call Science. It has to guarantee the truth of conclusions clearly and distinctly inferred when the course of proof is no longer attended to. But there are at least two ways, not distinguished by Descartes, in which it may do this. It may be taken either as guaranteeing the truth of what has been (without doubt) clearly and distinctly perceived, a truth indubitable so long as the sequence of clearly and distinctly perceived steps is the object of attention, but doubtful when, reflecting on the conditions of knowledge, we consider the conclusion alone; or its sole function may be to guarantee the accuracy of our memory of the conclusion and of the clearness and distinctness of the proof. The former interpretation involves a vicious circle, as Descartes' critics were not slow to point out, and though he did not admit the charge, he imperceptibly transferred the doubt from clearness and distinctness to memory. We have now to consider certain difficulties involved in this change of front, and if possible find ways of dealing with them not inconsistent with the general trend of Descartes' thought.

(1) Descartes seems to have been forced to cut the knot instead of untying it. He has not shown *why* the hypothesis of an all-powerful deceiver should not throw doubt on each clear and distinct perception. It is apparently only because he cannot otherwise escape the imputation of circular reasoning that he has had to concede autonomy to them.

(2) Descartes admits, without explicitly distinguishing,

three orders of memory. (a) That which is so certain as not to depend on the authority of God—as, for instance, when he says that an atheist may know the equality of the angles of a triangle to two right angles (the proof of which involves memory in the sense of retentiveness).<sup>1</sup> (b) That which does not mislead, but without reference to God would be open to speculative doubt. (c) That which is actually misleading and therefore cannot depend on God's veracity; a frequent cause of error is that "We presume upon a past knowledge of much to which we give our assent, as to something treasured up in the memory, and perfectly known to us; whereas, in truth, we have no such knowledge."<sup>2</sup> The question Descartes has to answer is why memory should sometimes be challenged and sometimes not. Can we find a basis for this distinction and a justification of it? In particular, to which category belongs the memory involved in a single scientific or philosophic train of thought? The urgency of this question is obvious, since if the memory involved in the proofs of the existence of God cannot be shown to be intrinsically certain, these are evidently still open to the charge of circular reasoning.

Unfortunately Descartes' critics did not press him along these lines, and we must do our best to answer for him with the help of his own writings.

(1) If the all-powerful deceiver hypothesis does not affect each clear and distinct perception it is simply because intuition is ultimate. It was left for Spinoza to bring out this implication of Descartes' thought and to reconcile it with the appeal to God's veracity, in his restatement of that appeal with which we shall deal towards the end of this paper. Descartes is not seeking a criterion of truth, though he is often accused of pursuing this will-o'-the-wisp. The furthest he goes is to suggest—in a rather haphazard way—the sort of conditions in the object and in the knowing subject which make intuition or clear and distinct perception possible.<sup>3</sup>

<sup>1</sup> It might be argued that God would not deceive even an atheist, and that therefore the atheist's knowledge must depend on God. But the atheist could not himself use this argument to overthrow his doubts, among which is that presented by the hypothesis of an all-powerful deceiver. Any knowledge the atheist has cannot be liable to this particular doubt; therefore the knowledge of the equality of the angles of a triangle to two right angles, and consequently the work of memory which is involved in holding together the different parts of the proof, must be thought by Descartes not to require an appeal to the veracity of God.

<sup>2</sup> *Princ. Phil.*, XLIV., A. and T., viii., p. 21 (Veitch's trans.).

<sup>3</sup> It requires careful study of the relevant passages to discover these conditions. Here I can only summarise my conclusions as follows:

But the presence of these conditions is never a test of truth. Each intuition is self-evident, and if the word 'knowledge' can be applied to a number of isolated judgments whose truth is certain only at the moment when they are made, then we can have knowledge without the knowledge of God. But in any case this is not science in the sense of a body of interdependent truths, involving memory throughout. Without the knowledge of God science is impossible.

(2) (a) Descartes recognises (as we shall see shortly) that memory is involved in following out any single process of reasoning in which several steps have to be taken in succession, and the results of the earlier stages retained and carried forward into the later before the conclusion can be seen to follow from the premises. Such memory is not primarily, of course, reminiscence or memory of the past as such, but retentiveness, whereby the results of past mental process persist and are carried forward into subsequent mental process in such a way as to modify it through and through. Descartes himself makes no distinction, but following common usage calls reminiscence and retentiveness alike memory. To understand his attitude to memory in the sense of retentiveness we must refer to certain passages of his early treatise, the *Regulae ad Directionem Ingenii*.<sup>1</sup> In this work he is concerned rather to formulate a method of acquiring knowledge than to discuss the nature of knowledge, and consequently he treats memory from a rather different point of view. What he says, however, is important for the epistemological problem also, and though the *Regulae* is earlier than the *Meditations*<sup>2</sup> there is no evidence in his later writings to show that he had changed his mind.

The two important ways of acquiring knowledge are *Intuitus*, which is equivalent to the clear and distinct perception of the *Meditations*, and *Deductio*, which means "all necessary inference from other facts which are known with certainty".<sup>3</sup> Deduction involves movement and transition and 'borrows its certainty in some sense from memory';

- (1) The idea must be immediately present to an attending mind. (2) Its content must be separately conceivable and conceivable as existing separately. (3) It must represent its object at a certain level of generality, which may be called the essence of the object. (4) It must exclude any element of sense. (5) The object must be simple in the sense that we cannot perceive part of it without perceiving the whole. Judgments about such ideas are themselves clear and distinct.

<sup>1</sup> A. and T., vol. x., pp. 359 ff., especially Rules III. and VII.

<sup>2</sup> A. and T. assign 1628 as the probable date of the completion of the *Regulae*. The *Meditations* were ready for publication in 1640.

<sup>3</sup> *Reg.*, III., A. and T. x., 369, ll. 20-22.

intuition is immediate in its grasp of truth and in no way depends on memory.<sup>1</sup> But the line between the two cannot be sharply drawn; conclusions drawn 'immediately from first principles' may be considered as known either by intuition or by deduction, though first principles are known by intuition only and 'remote conclusions' by deduction only. (This suggests that Descartes does not find it always possible to determine precisely when memory is or is not involved; we have seen that he qualifies the dependence of deduction on memory by the phrase 'in some sense'. I suggest that he hesitates because he realises that even when in reasoning there is dependence on memory, the memory involved is not of the same nature as the recollection of a past experience, and is somehow less liable to mislead; he is vaguely conscious of a distinction between reminiscence and retentiveness and is not quite happy in treating them in the same way). Deduction may involve a long series of steps (each of which is an act of intuition) and though the truth of each is clearly and distinctly perceived, yet when we have reached the conclusion we may be unable to remember the route by which we arrived at it.<sup>2</sup> As an accessory to these two is a third process, called *Enumeratio* or *Inductio*. Descartes is confused in his use of this term. As originally introduced<sup>3</sup> it means a review of everything that concerns the problem in hand, by which we may be assured that no relevant fact has been overlooked; and this seems to be its meaning in other passages where in the course of the argument the word *Enumeratio* or parts of the verb *Enumerare* are used.<sup>4</sup> But at the beginning of Rule XI Descartes gives another definition, which he takes to be merely an expansion of that given in Rule VII, but which is really incompatible with it; and it is this second meaning which specially concerns us. Enumeration here means not a survey or review but an 'inference [*illatio*] drawn from many and diverse things'. It is no longer merely the preparation of the evidence but includes the work of drawing the conclusion. How, then, does it differ from Deduction? The answer appears to be that when a process of inference is regarded *qua* process consisting of a series of successive steps it is to be called *Deductio*. But when it is regarded as a

<sup>1</sup> " . . . ad hanc [sc. deductionem certam] non necessaria est praesens evidētia, qualis ad intuitum, sed potius a memoria suam certitudinem quodammodo mutuatur," *Reg.*, III, A. and T., x., p. 370, ll. 4-9; and cf. *Reg.*, XI., p. 408, ll. 7-8.

<sup>2</sup> *Reg.*, VII., p. 387, ll. 17-20.

<sup>3</sup> *Ibid.*, p. 388, ll. 18-24.

<sup>4</sup> *E.g.*, *Reg.*, XI., p. 408, l. 9, and *Reg.*, XII., p. 411, l. 14, and p. 425, l. 8.

completed movement, in which a certain conclusion is apprehended as derived from 'many and diverse things' which were not originally apprehended together so as to be combined in one view, it is to be called *Intuitus* if the process has been simple and clear, and *Enumeratio* if it has been complex and involved. Enumeration so understood involves memory, since we must remember the previous conclusions, or "judgments about the separate parts which have been enumerated,"<sup>1</sup> if we are now to see our present judgment as a conclusion inferred from them; for the whole argument, with all its different trains of reasoning, is too complex to be grasped as a whole. But memory is 'weak and liable to fail us'.<sup>2</sup> How is it to be relieved? The answer is simply that I must repeat in my mind the whole complicated piece of reasoning over and over again, until I can move so rapidly from premises to conclusion that 'by leaving almost no share to memory I seem to intuit the whole thing at the same time.'<sup>3</sup> (Descartes, however, never asserts that we can actually view the whole course of the argument at a glance, but only that we seem to do so. He does not recognise that retentiveness makes possible a single all-embracing survey of the evidence and the conclusion in their necessary connexion.) This method he calls the co-operation of enumeration with intuition, through which "they seem to become one by a certain motion of the understanding, which attentively intuits each part separately at the same time as it passes on to others".<sup>4</sup> Descartes' terminology is too much confused here to be straightened out without drastic measures. What perhaps he should have said is that intuition and deduction (*not* enumeration), working together, produce—by dint of repeating over and over again the same course of argument—enumeration in the second sense (*i.e.*, a complex deduction considered not as a process but as an accomplished fact), but an enumeration no longer made doubtful by dependence on memory.

<sup>1</sup> *Judicia de singulis partibus enumeratis* (p. 408, l. 9). Note the return to the first meaning of 'enumerare'. 'Enumeratis' cannot easily mean 'inferred' here. We do not have to remember the judgments made about what was inferred, but the judgments made about (*i.e.*, the conclusions reached from) all the separate pieces of evidence.

<sup>2</sup> *Reg.*, XI., p. 408, ll. 23-24.

<sup>3</sup> *Ibid.* Cf. *Reg.*, VII., p. 388, ll. 2-9, where by this method it is claimed that no stage in the process is left to memory. Again, however, I am said only to *seem* to have the whole before me in intuition.

<sup>4</sup> 'Haec [sc. regula] explicat quo pacto hae duae operationes se mutuo juvent et perficiant, adeo ut in unam videantur coalescere, per motum quemdam cogitationis singula attente intuentis simul et ad alia transeuntis,' *Reg.*, XI., p. 408, ll. 13-17.

The point of the passage, however, is clear so far as it concerns us. It is that in the *Regule* Descartes already regarded arguments which depend on memory as doubtful on that account, but held that by the practice of constant repetition the movement of thought can be so much speeded up that practically no memory is involved. Speed by itself, however, is not enough. The mind must be able to hold the different parts of the argument together and take them in at a glance. To do this it must both stand still and move—it must attend to each part separately and at the same time pass freely on to others. Let us illustrate from the process of understanding the proof of a proposition in Euclid. To begin with, each step is understood separately, so that when we have reached the conclusion we have not the whole argument before us, but only the final step and the memory that we had reached it by a series of clearly understood steps. The process at this stage is *Deductio*, and the memory involved is reminiscence, a reference to our own past experience. Then we go over the argument again and again, and after each repetition we are able to retain and carry forward more and more of the earlier stages of the proof so as to apprehend their connexion with the later. Finally we have the argument before us as a whole, the conclusion being seen to follow from the premises by a single inferential act. This act is either *Intuitus* or *Enumeratio* according to the complexity of the argument. Whichever it is, Descartes thinks that it is no longer made uncertain by its dependence on memory, because memory has all but disappeared. The truth is rather that memory in the sense of reminiscence has been replaced by memory in the sense of retentiveness. We no longer rely on our memory that we were certain of the previous steps. Instead, the steps themselves are retained, and we are not remembering as facts of our experience all or any one of the occasions on which we repeated the argument. There is now a present intuitive certainty as the result of repetition. Descartes is evidently puzzled to know whether memory is still present or not, but believes that at least it is not present in such a form as to throw doubt on the conclusion.

(b) Suppose, however, that after an interval during which we have not thought of the proposition or its proof we have occasion to refer to the conclusion, e.g., that the angles of a triangle are equal to two right angles, we shall probably regard this judgment as a permanent part of our knowledge, and it will not occur to us as necessary to recall the proof. If the interval has been a long one, the effort might cost time

and trouble. We remember that we were satisfied with the proof, and unless we are content not to question such memories, we can have no permanent possessions in the way of knowledge, and the growth of knowledge would be impossible, since we could have no foundations on which to build. But it is precisely this kind of memory which Descartes thinks liable to a speculative doubt that can only be vanquished by the appeal to a veracious God. The memory involved here is not retentiveness but reminiscence. We remember having had the experience of being convinced by the proof, and even if we cannot accurately determine the conditions of each or any one occasion on which we had this experience, the reference is none the less to facts in our past experience. Because reminiscence rather than retentiveness is here involved Descartes recognises the presence of memory in a form which is open to speculative doubt; but because knowledge as an ordered and growing system would be impossible if the doubt held good, it can be overthrown by an appeal to the veracity of God, who could not so completely deceive us.

(c) We have suggested that retentiveness as it functions in holding together the parts of a proof which we see as a single whole is taken by Descartes to have the same certainty as self-evident intuitions, and that the reminiscence involved in remembering a certain conclusion to have been clearly and distinctly proved by us may be guaranteed by an appeal to the veracity of God. It remains to ask (1) if there is any other work of the memory which is indubitable either with or without an appeal to God, and (2) in what category we must place the memory involved in the proofs of the existence of God.

(1) So far as reminiscence is concerned, Descartes evidently regards it, from the time of the *Meditations*, as inherently fallible, and there is no sign that he ever changed this opinion. If there were any other instances in which fallibility of memory would mean the collapse of Science, then no doubt he would urge that in those instances (and those only) its justification by the appeal to God is legitimate and convincing. But are there any such? I think not. If no memory of past facts were assured, except the memory that we had argued correctly to certain conclusions, Science would still be possible, though History could not claim to be scientific. Reminiscence, of course, remains practically useful, and may lead to results the truth of which can be proved without reliance on the reminiscence by which they were reached. And for such purposes it may be helped out by writing and



other sensible aids, though these could not support it against speculative doubts.<sup>1</sup>

As for retentiveness, it cannot itself mislead. It is the vehicle of evidence for judgments, but the evidence taken at its own face value is weighed at the time the judgment is made, and I am convinced or not by what is before me; there is no reference to or inference from the method by which it came before me. When I am relying on present insight into evidence which would not be before me if it were not for retentiveness, I am not relying on retentiveness; I am relying on the evidence itself in just the same way as I should rely on it if it were before me for the first time. So far as I take what is before me to be good evidence on the ground that I remember it, and not because I am now convinced by direct inspection of it, I am relying on reminiscence, not on retentiveness. Retentiveness certainly makes possible the growth of my knowledge and of my powers of dealing with evidence, but I do not argue from it as from evidence.

Following popular usage, Descartes confuses reminiscence and retentiveness under the one term 'memory'. Since reminiscence is fallible, retentiveness is for him tainted with the same suspicion, and escapes from it not because it is of a radically different nature from reminiscence, but because it seems to him to be reminiscence present in so slight a degree as not to carry any uncertainty with it.

(2) If either of the proofs of God's existence and veracity depended at any point on conclusions presented by retentiveness but believed true because we remember that the proof which led to them was clear and distinct, then it would be circular; for it is just that type of reminiscence which has to be guaranteed by God's veracity. The question is, are they so complex and involved that the mind cannot retain all the evidence required to draw the conclusion by a single intuitive act? It is true that the first or causal proof seems to occupy the whole of the Third Meditation, and the ontological argument the greater part of the Fifth. But the 'proofs' them-

<sup>1</sup> Cf. A. and T., v., p. 148, where in reply to the objection that though God may guarantee my *ingenium*, still my *memoria* may mislead me, Descartes is reported by Burman as suggesting the use of writing and similar aids, if a man is doubtful about the goodness of his memory. He might have added that they cannot take the place of the appeal to God to support memory, because (a) they are sensible and therefore inherently misleading, and (b) the presence of the conclusion of a proof in writing, even if accompanied by the whole course of the argument, cannot prove that you are right in remembering the process to have been self-evident; unless you can rely on your memory you must attend to the whole argument again in detail.

selves are in each case brief and clear, if we separate them from the preliminary matter which clears the ground for them. Descartes himself remarks that once I have freed my mind of prejudices and of the 'images of sensible objects' there is nothing I can know sooner or more easily than the fact of God's existence.<sup>1</sup> He admits that those who do not remember all that goes to the making of the proof will consider it sophistical,<sup>2</sup> but he evidently does not regard the effort of retention as beyond the scope of an intelligent mind. In fact, the essence of the 'proof' is easily grasped. The knowledge of our own existence as limited and imperfect (and the knowledge is not upset by the possibility of a deceiver), is bound up with and inseparable from the knowledge of a perfect Being on whom we are dependent. Again, the ontological argument merely gives a reason for the fact that we can have no *mere* idea of the whole of Being.

It is time to sum up the conclusions we have so far reached. The beginning of the third Meditation suggests that the general rule 'what is clearly and distinctly perceived is true,' inferred from the *Cogito ergo sum* and guaranteed by the veracity of God, is to be used as a basis of inference to prove the truth of each clear and distinct perception. But (a) this involves an obvious circular argument (independent of that involved by the appeal to God's veracity) and (b) it is inconsistent with the general trend of Descartes' thought, which, both in the *Regulae* and in the *Meditations* treats intuitions or clear and distinct perceptions as self-evident. None the less the general rule is worth proving, because it is needed to support the conclusions which I remember to have reached by clear and distinct steps, when I am no longer attending to those steps. Descartes confuses two possible reasons for doubting these conclusions. (a) I may doubt whether what was clearly and distinctly perceived was necessarily true, without doubting that it was so perceived. (We suggested that the particular error I may commit in making mathematical judgments is the assumption that a material world exists to which the judgments apply). (b) I may doubt simply whether I am rightly remembering the conclusion; or I may be mistaken in remembering the steps of the proof to have been clear and distinct. It is here the accuracy of memory, and not clear and distinct perception, which is doubtful. The general rule, no longer derived from the clear and distinct perceptions themselves but solely

<sup>1</sup> *Med.*, V., A. and T., viii, p. 69, ll. 4-9. Cf. *Med.*, III., A. and T., vii, p. 47, l. 24—p. 48, l. 2.

<sup>2</sup> Reply to Obj. II., A. and T., vii., p. 120, ll. 3-9.

from the veracity of God, fails to overthrow the doubt in its first form, because a circular argument is still involved. The rule hardly applies to the doubt in its second form, unless we substitute 'most evident' for 'clear and distinct,' as Descartes sometimes does; but he tends rather to substitute a direct appeal to the veracity of God for the appeal to a rule derived from that veracity. (The fact is, though Descartes fails to see it, that if God is veracious there is no doubt against which to appeal; for the doubt is the possible un-*veracity* of God). Descartes has been led by the fear of arguing in a circle to accept clearness and distinctness as ultimate and indubitable, but he still needs God to support memory. Unfortunately he does not make it clear how far this support is to extend, and he fails to distinguish between reminiscence and retentiveness. We suggested that he took retentiveness to be memory present in so slight a degree as not to mislead; that God is needed to support the memory that certain conclusions had the force of clearness and distinctness; and that all other memory is inherently fallible and open to speculative doubt. Since the proofs of God's existence need only retentiveness and not reminiscence they are not open to the imputation of circularity.

There is still one important point concerning the appeal to God's veracity which has to be brought out; it is one which Descartes never grasped for himself, though it is really implied in his own theory, and would have helped him against his critics. He could not give up the idea that if the appeal to God's veracity is to have any relevance to clear and distinct perception, it must be used not directly, but through a rule inferred from it, *viz.*, the rule that all that is clearly and distinctly perceived is true. When the application of that rule involved him in a circular argument he had reluctantly, and without explicitly admitting it, to give up the idea that clear and distinct perception is affected by the possibility of a deceiving demon or the certainty of a veracious God. In this he was wrong. There is, as Spinoza showed, a way in which the appeal to God's veracity can be used in order to establish the independence and certainty of clear and distinct perception without arguing in a circle. It is quite unnecessary to establish the rule that all that is clearly and distinctly perceived is true. The only source of doubt to which clearness and distinctness are exposed is the possibility that there is an all-powerful deceiver. Once God is proved to exist and to be veracious there is no doubt left against which to appeal, and therefore no need to formulate a rule to meet it. Descartes would have welcomed this conclusion, since he

found that the rule could not be proved from God's veracity without arguing in a circle.

Relatively to clear and distinct perception, then, the part played by the appeal to God's veracity is negative. It removes a doubt, but does not create a ground on which the truth of clear and distinct perception is to rest. You raise a bogey to make it vanish—and it vanishes by turning into an angel. It was left to Spinoza to define the position clearly. To meet the imputation of circularity Descartes changed his ground, and it has been the main task of this paper to bring out the implications of that change. Spinoza put forward his defence as a substitute for that of Descartes. The defence was good, but it did not exhaust the uses that must be made of God's veracity if Science is to be possible. Descartes should have stood his ground, as Spinoza did for him, but even had he done so he would still have had to go on to establish the validity of memory. Though the part played by the appeal to God is negative in so far as it concerns clear and distinct perception, yet if Science is to be possible the appeal to God is necessary as a positive basis to support certain beliefs which are not clear and distinct and would consequently not be certain even apart from the possibility of a deceiver.

It remains to support what has been said by developing and interpreting Spinoza's restatement of the part played in the Cartesian system by the appeal to God's veracity.<sup>1</sup> Before we set ourselves to answer the question whether or not there is an omnipotent Being, and whether, if He exist, it is His nature to be deceitful or veracious, it appears to us as possible (though of course not certain) that there may be such a Being, and that it may be His nature to deceive us. Now, there are a large number of propositions (which we call clear and distinct) whose truth we find ourselves unable to doubt while we are attending to them alone; but when we consider along with them the possibility that there may be an omnipotent deceiver who created us so that we might be deceived even in what seemed most clear to us, we see that unless this possibility can be proved not to have been realised, all those propositions—with one exception—may, certain though they seem, be false. We have looked for a source of doubt and found one based solely on our ignorance; it is a doubt which may be confirmed or annulled by further knowledge. The one exception is the knowledge of the existence of the self, the intuition that 'in thinking,

<sup>1</sup> *Princ. Cart. Prolegomenon, sub artic. 'Liberatio ab omnibus dubiis,'* Vloten and Land's 3rd ed. (Martin Nijhoff, 1914), vol. iv., pp. 115-117.

I am'. For the attempt to doubt brings, instead, confirmation; the very power to doubt defeats itself. The other propositions are doubtful because in looking round for a reason to doubt we find one; the proposition "that I exist" is indubitable (and independent of the existence of a God of any kind) because in looking about for a reason to doubt I can find none—and, indeed, at each attempt I find actual confirmation of what I am seeking to doubt. If I can find any other proposition which in the same way defies all doubt I must hold that also to be true.

Now, since our doubt of the truth of our clear and distinct perceptions was founded simply on ignorance, we must see whether we can free ourselves from this ignorance and so either banish or confirm the doubt once and for all. We find that we have a clear and distinct idea of God which shows us that He must exist and that He cannot will to deceive us. Here we have a clear and distinct perception which must be true if we can find no reason to doubt it. But the old reason has gone with the ignorance on which it was based; it would be circular reasoning with a vengeance to appeal to the doubt of the existence of a veracious God in order to overthrow my positive certainty that he does exist. If a proposition A appears self-evidently true, its self-evidence cannot be called in question unless some proposition other than A and necessary to its truth is shown to be false; to doubt the truth of A solely on the so-called ground that A may be false is to doubt without a ground at all. But I find that not only has the old doubt that beset my clear and distinct perceptions vanished, but it has taken with it any other source of doubt that might, though undiscovered, have been previously possible owing to my ignorance. If God has created me so that I cannot be deceived in what I clearly and distinctly perceive, then about clearly and distinctly perceived propositions no doubt is tenable. My discovery of the truth of the proposition that God exists and is no deceiver has removed a source of doubt *which never could have affected itself* (and so the argument has not been circular), but which did affect (while I was ignorant of this truth) all other clearly and distinctly perceived truths but one. In seeking to confirm that doubt I have removed it, and with it all possibility of doubting. I invited total destruction and have received lasting salvation.

A further defence of the Cartesian position, of the same nature as the Spinozistic, but better founded in what Descartes says himself, is possible if we press the suggestion already made about the particular way in which a malevolent

demon may be supposed to deceive us. According to that suggestion, if we are deceived in our clear and distinct perceptions it can only be because a malevolent demon brings it about that there is nothing real or really possible corresponding to the content of our clear and distinct ideas. For instance, if we are deceived in our clear and distinct geometrical judgments, it is because what we mean by circle, triangle, etc., cannot exist, since nothing exists corresponding to our idea of extension or corporeal nature, of which these are modes. Since geometrical judgments form a large proportion of those which can be called clear and distinct, the non-existence of extended substance would be responsible for much deception. But there may be other applications of the same principle. In the causal proof of the existence of God it is necessary to make certain judgments about the nature of causation, as, for instance, that "there must be at least as much reality in the efficient and total cause as in its effect."<sup>1</sup> Now, though these judgments are clear and distinct or "manifest by the natural light," yet they would be false if (and, on our assumption, only if) a malevolent demon had so constituted the world that there was nothing in reality answering to our idea of causation. The causal argument for the existence of a veracious God is therefore faced with a charge of circularity, since it assumes that causation belongs to the nature of the real world, though the assumption cannot be justified until God's existence is proved. But this charge melts away when it is seen that the very statement of the possibility of deception in what is most clear and distinct assumes causation as a fact. "A malevolent demon who is the cause of our being and of the world around us may have so constituted us that we are deceived even in what appears most clear and distinct." There are, however, two beliefs about existents which would be established rather than overthrown if this hypothesis were true—the belief in our own existence and the belief in causation. We must exist to be deceived; and if it is true that a demon causes the deception, then there must be something real answering to our idea of cause and effect. "A malevolent demon who is the cause of our being and of the world around us may cause us to be deceived in thinking that there is such a thing as a cause" is a self-contradictory judgment. If we are right, then, in suggesting that clear and distinct judgments about the nature of causation can only be false if there is no such thing as causation, then their truth is not touched by the hypothesis

<sup>1</sup> Cf. *Med.*, III., A. and T., p. 40, ll. 21-23.

of a deceiving demon, and the causal argument for the existence of God is not circular because it takes them to be true.

If our attempt to give a coherent account of what underlies Descartes' general position has had any success, it will be evident that the *Cogito ergo sum* and the general rule supposed to be inferred from it must fall into the background. The *Cogito* proves nothing but itself—and even that is far less than Descartes supposed. It is not, as is still too often assumed, the first piece of firm ground appearing above the waters of universal doubt, on which the whole edifice of science can be erected. There is no Atlas in Descartes' philosophy to bear the world of human knowledge. The only point distinguishing the *Cogito* from other intuitions is this, that it alone stands firm against the hypothesis of an all-powerful deceiver. If the existence of a veracious God could not be proved, the existence of the self would alone be certain. But this is not enough to make it the basis of other certainties, unless the proofs of God's existence depend on it. Does any of them do so? Clearly the 'ontological argument' does not. It involves only the existence of the idea of God; and if this idea involves a self to perceive it, then the argument may be said rather to prove the existence of the self than to depend on an independent proof of it. And Descartes himself says<sup>1</sup> that even if all the conclusions of the previous Meditations were false the existence of God would be at least as certain as any truth of Mathematics. In the 'causal argument' the existence of an imperfect self and a perfect God are seen to involve one another, but the latter is certainly not inferred from the former. On the contrary, "in some way I possess the perception of the infinite before that of the finite, that is, the perception of God before that of myself".<sup>2</sup> The only argument for the proof of God's existence which seems to presuppose the existence of the self is that given at the end of the third Meditation in support of the 'causal argument,' to the effect that my existence cannot be explained except as derived from God; but even here what is proved is only that *if* I exist God must be the source of my existence and maintenance. Even if we admit that the *Cogito ergo sum* could be used here as a premise for the proof of God's existence, it is evident that (a) Descartes does not so use it and (b) the other two more important proofs are independent of it. The

<sup>1</sup> *Med.*, V., A. and T., vii., pp. 65-66.

<sup>2</sup> *Med.*, III., A. and T., v., p. 45, ll. 26-29.

*Cogito*, then, is not essential to a coherent account of knowledge on Cartesian principles. As for the general rule, if it is merely a way of stating as a fact of experience that there are 'perceptions' which are self-evident and that these have certain characteristics suitably described as 'clearness' and 'distinctness,' then there is no harm in it; but it cannot be established from the *Cogito* and then used as a basis of proof for each clear and distinct perception. Descartes is fundamentally an intuitionist, who attempts to define the conditions of intuitive judgment. The appeal to the veracity of God—itself intuited—does not, as interpreted in this paper, mar the intuitional nature of knowledge. It is at bottom a claim that the world is rational and coherent and consequently capable of being known not in isolated fragments merely, but as a single ordered and continuous system.



#### IV.—CRITICAL REALISM AND SUBSTANCE.

BY ROY WOOD SELLARS.

CRITICAL realists are in the stimulating position of being forced to reanalyse many categories which idealism had too hastily thrown into the discard. In recent writings I have tried to show that knowledge of genuinely external, or transcendent, objects is possessed by the human mind and have pointed to the mechanism which mediates such direct knowledge. Such direct knowledge, I have argued, rests upon the cognitive, or revelatory, value of discriminated contents which function within the act of cognition. The critical realist differs from the naïve realists chiefly in two ways: (1) he is aware of the mechanism making knowledge possible and not, as the naïve realist, only of the result; and (2) he is led by reflexion to revise the content of knowledge, that is, *the object as thought*. Such a theory of knowledge may be said to lie between naïve realism and representative realism, for it asserts, with the first, the directness of knowing and, with the second, the contents and processes which mediate this direct knowing. Its insight comes from a more careful study of the conditions and claims of knowing than was possible in the seventeenth century. Now, may not this alteration in theory of knowledge involve a new approach to the category of substance? Instead of rejecting substantial things—as the idealist was led to do—may we not accept them and interpret them without landing in any self-contradiction?

In the present paper I wish to study the category of substance in the light of modern science and critical realism. As a physical realist I believe in *physical systems* (ordinarily called things) which exist independently of our knowing them and which have specific characteristics. From the very beginning I want to dissociate this return to substance from Cartesian dualism. I can see no *a priori* reason why certain evolved physical things, such as human organisms, should not have mental properties and include psychological processes. Such, as is well known, is the thesis of emergent, or

evolutionary, naturalism. But more of this particular point later.

The elimination of substance as a category began with idealism. The first step was the rejection of physical substance. Leibniz and Berkeley may be said to have inaugurated this development. And then came empiricism and phenomenism with a like attack upon spiritual substance. Something of a compromise on this latter was symbolised by the adoption of the term subject by the idealism of the nineteenth century.

When we look over this movement, we soon realise that it was motivated by two lines of argument which reenforced one another, *viz.*, (1) an epistemological motive and (2) a logical motive. The first cast doubt on genuinely external, or transcendent, objects, while the second sought to point out contradictions in the very idea of such realities. I shall argue that this whole development had only a partial validity. Because of an inadequate epistemology, possibilities were ignored which must again be brought to light. It is my present purpose to explore these possibilities. While I have indicated them in my books, I have apparently done so in such a terse fashion that they have been misunderstood or ignored.

## I.

Locke is a convenient point of departure. I believe that it can be maintained that Locke's theory of substance was somewhat of a parody of even the Medieval doctrine. As is well known, Locke formulated his position in such a way as to leave substance, or matter, a hidden core supporting adjectival entities called primary qualities. This construction was open to the objections, advanced by Berkeley, which we shall shortly study. Is substance unknowable? Is it something hidden by its very nature from cognition? Does it support entities which can be called qualities and which are really extrinsic to it? I shall try to show that this whole formulation is vicious and unnecessary. The physical realist believes in physical systems having definite knowable characteristics. Is this belief vulnerable to Berkeley's arguments? In other words, can we think external physical things without falling into logical absurdities?

We may call external things physical systems and consider them substantial or substantive. What do we mean by this? Surely several things. We consider them existents which are continuants and not dependent upon something else like mind or deity for their existence. This means that we hold

them to be self-existent. Such self-existence does not imply self-sufficiency in the sense that they are unaffected by their surroundings. Surely self-existence does not involve isolation of the sort affirmed in extreme pluralism. Physical systems are concrete bodies in definite commerce with other physical systems. And commerce presupposes existence rather than creates it.

With this frank physical realism in mind let us for a moment return to Berkeley's criticism of Locke's formulation. Locke had set up a *substratum* spread under accidents. Notice that we have spoken of *things* having characteristics. We have not as yet set up any theory as to what characteristics are nor as to how things possess them. That we shall do shortly. In the *Three Dialogues between Hylas and Philonous*, Philonous suggests that this substratum is something in its own nature entirely different from its accidents. Hylas replies: "I tell you, extension is only a mode, and Matter is something which supports modes. And is it not evident the thing supported is different from the thing supporting?" And Philonous: "So that something *distinct from*, and exclusive of, extension is supposed to be the substratum of extension?" Clearly, this leads to the difficulty of conceiving the relation between matter (substance) and its primary qualities if they are thus external to each other.

But we must ask whether this construction is necessary. Is the relation of its characteristics to a physical thing to be thought of as a relation between an unknowable substratum and the accidents it supports? It is obvious that we must determine the nature and the reach of knowledge, on the one hand, and the relation between an object and its determinate nature, on the other hand, before we can go farther. In what follows I shall try to reanalyse the whole situation and keep in mind both the ontological categories and the cognitive approach to those categories. Surely characteristics are not adjectival entities supported externally. When properly interpreted they are *intrinsic* to the thing known. The thing is the reality and includes its nature seamlessly. It is our thinking which distinguishes between a thing and its characteristics and is easily misled into a false separation between the two on the ontological side. We reify that about the object which we can discern and are then, perhaps, led to the idea of a substratum to support these reifications. I shall argue that we must at one and the same time give up this kind of a substratum and this kind of qualities. We must think more delicately and carefully.

## II.

Let us disregard Locke and come back freely to the deliverances of our own knowing. Can we then harmonise our cognition with the ontology which it seems to set up?

To me it is a demand of knowing that the object known be of a *determinate nature*. It is a that-what. But Locke's construction is a parody of this demand. The determinate nature of an object is intrinsically inseparable from the object and not stuck on it externally in some incomprehensible fashion. Here we are face to face with ontology. It is evident that characteristics are not entities and do not need support. Their relation to their object is far more intimate than that. They are elements of the nature of the object. But even this way of putting it is not penetrative enough. We must not think of the nature of an object as in any way distinct from the object. The object is a *determinate object*. Thus when we say that a physical thing is extended we do not mean that there is some substratum which possesses an adjectival entity called extension but simply that the thing is correctly thought of *as extended*. It is that kind of a determinate object. To say that a thing has a definite structure does not mean that there is a substratum which owns an entity called structure but simply that the thing is intrinsically structured. And so on. This means that we must not be controlled by grammatical forms or by metaphors, but that we must seek to clarify our actual thought of objects.

This analysis signifies that when we speak of that-what or things with determinate natures we really mean determinate objects. As we shall see, our unavoidable cognitive approach to objects tends to make the nature of objects, that which we know about objects, stand out almost in abstraction from the object. It is to avoid this epistemological abstractness that we must stress ontologically the fact that the reality is a determinate object in determinate relations with other objects. I would hold, then, that the categories of object and the nature of the object are mutually implicative. The reality is the determinate thing. But our knowledge picks out the determinations of the determinate thing and abstracts them, for it is the only way we can think the object. Thus, unless we are on our guard, our inevitable cognitive approach tends to introduce a dualism into the object which ontologically does not exist. We speak of a thing (subject of the judgment) which has properties (predicates of the judgment). But we should penetrate beyond this logical form to reality as thought as against the mechanism of our thinking it.

Logical structure must not be identified with ontological structure.

Now if this basic reality of a determinate object, a that-what, is once granted, we can reject at once the scheme which dominated representative realism of the Lockian type and animated Berkeley's dialectic. 'Support' and 'inhere in' and 'spread under' are clearly totally misleading metaphors for this basic and ultimate unity. The determinate nature of an object is not something distinct in any fashion from the object. The object and its nature, or characteristics, are intrinsically one. In knowing its characteristics, we know the object; and this is the only way we can know it. And, for the physical realist, the object is a physical system of a definite sort. We must not think of the object as retreating from its characteristics into a sort of majestic aloofness; nor must we think of an inner core as unknowable and an outer shell as knowable. To know a physical system is to know it as extended, massive, structured, behaving, etc. That is the way the object manifests itself and that is the way the object is in itself.

If this analysis holds, Locke committed the sin of separating the object (physical system) and its nature so that the object becomes a something-I-know-not-what back of its nature as a complex of primary qualities which are, as it were, hypos-tatised into entities which must be supported. Knowledge is given the deceptive goal of a substratum which cannot be known and which yet cries out to be known. But if this substratum has no determinate nature, is it even a possible object of knowledge? And if it has no determinate nature and is, therefore, not a possible object of knowledge, is it not, as Berkeley argued, a complete fiction?

Surely, the only way of intellectual salvation is to see that the attempt to change the nature of an object into a set of entities called accidents, or qualities, is to distort the intrinsic and unique identity of a thing and its characteristics. In fact, I am reluctant to use the term relation in this connexion for I have found that philosophers have constantly been misled by it. It seems to me, rather, that when we speak of the characteristics of a thing we are making a logical distinction which involves no existential separateness.

### III.

Since I am at present engaged in a constructive analysis, I shall disregard the history of the distinction between a substance and its accidents, only registering my conviction that

this distinction is a mistake. It is truer to our actual thinking to speak of a thing and its characteristics. And even here we must not be misled by language. A thing is not separate from its characteristics, nor are characteristics separate from the thing. The characteristics of a thing are that about a thing which can be cognitively grasped.

There are, then, two errors to be avoided. We must not reduce a thing to its characteristics because the reality is a determinate thing. And we must not rob a thing of its determinate nature and thus make it an unknowable. Idealism has always tended to make the first mistake, while agnosticism has made the second. We must move with more delicacy than have these positions. We know things. What, then, does knowledge grasp? Idealism and neo-realism tend unavoidably to identify the that with the what. Existence disappears into its characteristics. The object passes into knowledge without a remainder. It is against this that the critical realist protests. Knowledge is knowledge, and yet it is never the actual equivalent of the object. It reveals the object, and yet it is other than the object. We cognitively grasp the nature of the object but, in so doing, we get the nature as an abstraction. No literal part of the object gets into our minds. It is, as it were, the ghostly outline, or form, of things which we grasp. To realise this is to understand what human knowledge of external things is. It inevitably falls short of *being* itself. And yet it is knowledge. This means that we must not expect of knowledge what knowledge cannot give. It is a revelation of the structure, relative quantity and behaviour of objects; but the objects as realities are structured, massive, energetic; they play a rôle in the economy of nature; they exist.

To appreciate our knowledge of things is at the same time to understand what knowledge can never be. Being is always other than knowledge. To know a thing is not to be it. It is a cognitive grasping of the determinate nature of an object, these determinations being translated into human formulæ of measurements and patterns and possibilities. In this sense, it is a genuine vision of the nature of the object, that is, of the object as a determinate thing. But such a vision presupposes the object's existence, presupposes that there is a realm of being.

I am quite aware that this epistemology which stresses the peculiar nature and reach of knowledge breaks sharply with immanentist traditions. It is, however, inseparable from a frank physical realism. We interpret things in terms of logical ideas which reveal their characteristics or determina-

tions. We believe that physical systems are extended, measurable, structured, active. But this does not mean that things are equatable with a complex of universals. Sense-data and universals are immanent, are intrinsic to the act of cognition; while characteristics are as transcendent as physical things themselves. It is in this fashion that an adequate epistemology harmonises with ontological demands.

## IV.

For my form of critical realism, knowing is an interpretation of the object, a peculiar grasping of its characteristics or determinations in terms of, and by means of, logical ideas held before the attention in the complex act of cognition. These logical ideas are intrinsic to the mental act which is a brain-mind act resting on the activity of the whole organism. It is a postulated revelation of the nature of the object and this turns out to be pattern, that is, constitution, composition, behaviour, all presented at the scientific level of cognition in terms of the results of measurement. What we know about things is a kind of abstraction, a sort of ontological form, the logical outline of things.

We are now in a position to discuss the age-old question of *universalia in re*.

I would distinguish sharply between universals and characteristics or determinations. Universals, like all logical ideas, seem to me to be always *in mente*. That is, they are intrinsic to the complex act of cognition by means of which the object is known. It is the characteristic of the object that is *in re*, as constituting its determinate nature. Thus universals are *in re* only in a Pickwickian sense as cognitively revealing the specific characteristics which are intrinsic to things. In knowledge they are so one with the characteristics which they reveal that we do not at the moment distinguish them and give them their proper locus. And yet as soon as we step from epistemology to ontology we must do so or else get into all sorts of unreal problems. Because universals are logical tools for revealing the characteristics of things the statement that universals are in things is an ellipsis for saying that we know the characteristics of things in terms of universals. And this cognitive union expresses an ultimate correspondence between them which makes the ellipsis almost justifiable. The determinations of reality are translatable into universals. It is for this reason that we can speak of the physical world as having a logical structure. It is, if you will, a touch of anthropomorphism, and yet an unavoidable



one. And since the critical realist maintains that the object *with the assistance of the subject* controls this logical structure in the mind, it is an anthropomorphism which calls attention to man's oneness with the world.

Yet ontologically the characteristics of a thing are as transcendent as the thing itself and one with it. They are also as specific as the thing of which they are the characteristics. Each specific characteristic is sustained by the object and is seamlessly one with it. In this fashion the critical realist assigns universals to epistemology and characteristics to ontology.

This distinction between universal and characteristic seems to me to clear up many points which have hitherto involved confusion. It rids us of the temptation to postulate entities of a timeless sort called essences (Santayana and Drake) or eternal objects (Whitehead) with their ingressions and embodiments. To speak of essences as embodied in objects is to resort to a misleading metaphor. And yet, unless the distinction between universals and characteristics is made, universals must be *in re* or else agnosticism follows. I would also suggest that this distinction does justice to the motives underlying Stout's distributive theory of universals. It is the specificity of characteristics that Stout—if I mistake not—has in mind.

In this analysis I am, I presume, nearer to Aristotle than to Plato. In fact, I am very much of an anti-Platonist even though I recognise to the full the contributions of Plato to an adequate theory of knowing. But while I am nearer to Aristotle than to Plato, I dissent from Aristotle in my conception of *ontological form*. I would take a step still farther from Plato, a step still nearer naturalism and to the intrinsic unity of form and matter. Being is always formed being. There is no being without form and no form apart from being. But more of this later.

This distinction between universals, as intrinsic to the act of cognition, and characteristics as intrinsic to the object known enables us to deal with another of the puzzles of thought, the problem of individuality. Idealism has tended to conceive an object as a complex of universals. This led to the difficulty of differentiating one thing from another. The realist, on the other hand, appealed to a stuff which, united with universals, would give individuality. The stuff of a thing was the principle of individuality. But this stuff was unknowable and also the nature of the union was scarcely thinkable. We may say that physical realism has always been handicapped by this apparently unescapable dualism.



Let us see whether critical realism can avoid it. Do we know one element of reality and are we ignorant of another element? Or do we know an object in knowing its characteristics?

It is readily seen that, once we clearly distinguish between universals and the specific characteristics of an object which they cognitively reveal, this traditional problem takes on a new and solvable form. A physical system is not a peculiar union of a stuff and universals. Instead, it is an organised whole with determinate characteristics expressive of what it is. In knowing these characteristics, we know the physical system. But, unless we are very careful, cognition, which knows the object in terms of its characteristics, leads us to abstract and reify the characteristics and thus to introduce a dualism in the object. It has been our thesis, instead, that ontological form is intrinsic to the object. The reality is a formed, or determinate, stuff. Knowledge reaches to things and illuminates them; and yet there is a plus to things which must not be ignored. We are here confronted by one of the most delicate problems of thought. *It is the question of the precise grasp of knowledge.* It grasps objects after its own nature; we do know objects. And yet this grasping is always other than a being of the object. The abstracted form of an object is a shadow, an outline. The reality is the formed object. In this sense, cognition enables us to know an object, and yet such knowledge is other than being. The physical realist believes that ontology rejects as inadequate and mistaken a purely logical realism.

## V.

But before I study the category of being in more detail I would like to say a few more words about universals and their rôle in cognition. I shall be very brief and concern myself with the relation of universals to sense-data and to the specific characteristics of things.

First, how can two objects be known by means of the same universal? My reply is, *that specificity does not involve uniqueness.* The roundness of one pea is existentially as specific as the roundness of another pea, both being expressive of the metabolism of the pea in the pod. This specific characteristic is intrinsic to the kind of physical system, to its energies, to its line of growth. Yet this fact does not preclude the similarity of results. Hence, they can both be correctly enough revealed by the same logical idea, sense-datum at the perceptual level, universal at the explicit, judgmental level. Let us remember that it is things that we

compare primarily and not universals; this is because cognition is directed first at things. And this is why we speak of two things as alike when they are revealed by the same universal. We have every reason to accept the world as it is known. And this world of ours is known as containing many similar things. And once we distinguish between logical ideas functioning in acts of cognition and specific characteristics intrinsic to objects, this otherness involves no contradiction. We do not have to speak even of the same universal embodied in different matter. Our epistemology must harmonise with the necessities of ontology. And by this distinction between universals and specific characteristics we have shown how this is possible.

We should note that universals grow up in the mind in the process of knowing objects. They are moulded upon that activity, and universals take final form in judgment with its use of language. Here we have a high level of symbolisation and generalisation. All this tends to make us forget that in specific acts of cognition these universals are nearly always specified to fit specific data. This shape is never quite like that shape; this colour is seldom the exact shade of that other. In strict universals we stress what may be called a *type* which covers and permits variations. These variations are the instances.

For this reason it has seemed to me best to speak of logical ideas or logical discriminations to cover both sense-data and universals. I would hold that such logical ideas reveal the characteristics of objects and are so used in interpretative cognition. Logical ideas may be sensory or they may be conceptual. In both cases their function is the same in cognition. And it is out of primitive logical ideas that universals in the strict sense arise and it is upon them that they rest. There is this much truth in the distributive theory of universals. And yet this theory reflects still more a confused sense of the specificity of characteristics in the object known.

We are at last ready to handle the problem of substance constructively. Our point of departure is this, that we know individual physical things in terms of their specific characteristics and that these are not entities supported by an unknowable substratum, but the outline, or form, of the thing disclosed to cognition and standing out abstractly as a consequence. We also realise that knowledge has the reach peculiar to its nature. It grasps the characteristics of things but cannot participate in their being. This ultimate thing knowledge can never do. It is as near to an external thing as we can

get. But to know a thing is not to be it. Knowledge falls short of existence. And, finally, let me point out that, contrary to Dr. Bosanquet's dialectic, the critical realist regards the existent as a that-what and never a mere that.

## VI.

From the beginning, then, we can reject the Lockian construction as false and misleading. A clearer idea of characteristics shows us that they are not entities to be externally supported by a substratum. It is the whole determinate thing which exists. Characteristics taken by themselves are abstractions.

But if characteristics taken by themselves are abstractions, what is it that exists? How shall we conceive existence? We are on the track of the meaning of such terms as stuff, matter, physical reality, content of being. What do these terms stand for? To answer this question we come back again to the context of cognition.

The act of cognition is the expression of ourselves as existents and is directed toward another existent. Both the known and the knower are realities. Now in going back to the level of naïve realism we quickly note our sense of existences, that is, of something as real as ourselves to which we must adjust ourselves. This sense of reality is, I am sure, coexistent with any specific knowledge. It furnishes the context of it. Things are as real as we ourselves are. *All this involves no intuition of being but merely our sense of reality*, something which grows up in us on adequate psychological grounds. It has been abundantly proven that our sense of external existence grows up in us step by step with our sense of our own existence and *vice versa*. Thinghood is, accordingly, a category which has a normal development in human thought. It develops step by step with our knowledge of the nature of these existents which surround us.

Now I should hold it a great mistake to assume that our sense of reality involves any intuition of the content of existence. It is much more an attitude with correspondent meanings. The nuclear ingredient in our thought of thinghood is this sense of external existence. It furnishes the sheet-anchor of knowledge but is not itself an element of knowledge. Rather is it a presupposition of knowledge with which knowledge must harmonise. Hence it is not a predicate in the ordinary sense, a fact which both Hume and Kant realised and which is often to-day expressed by the saying that we cannot define existence. The most we can

do is to point out the experience and indicate its psychological foundations.

Now this affirmation of an object, this sense of external things, is the context of cognition. From the time of Aristotle it has been recognised. The subject of a judgment symbolises an individual thing which is interpreted by predicates.

Individual things are, then, existents. They are substantives. Here we have the ultimate fact which all knowing presupposes and develops. It seems to me that, in philosophy, the terms, matter, stuff, content of being, etc., have but reflected this ultimate situation. They have stood for being existence, what exists. None of these terms should be taken to imply any particular scientific theory of the content of being. Matter in the philosophical sense may be variously interpreted—according to the prevailing knowledge—as inert stuff, energy, electricity, waves in ether. But in each case it presupposes this more basic meaning of that which exists. And clearly, if critical realism is right, the characteristics of being must conform to our tested knowledge. Being must be capable of organisation to form physical systems capable of various kinds of behaviour.

To-day our knowledge of the external world proclaims that that which exists is active and system-forming. The kind of matter that Berkeley rejected as unable to cause ideas is no longer believed in. We conclude that that which exists is known as regards its characteristics. It is not an unknowable substratum supporting accidents. Knowledge is directed at things and is an interpretation of them, but it does not deny, rather does it presuppose, their self-existence. This means that things have a kind of reality that predicates can never have. Knowledge is a vision of the characteristics of things, but things exist. And this is why we feel that a thing cannot be reduced to its characteristics taken abstractly. To ignore this is the mistake of idealistic rationalism. And there is a kind of logical realism to which Mr. Russell frequently succumbs which commits the same mistake. Another way of putting what I am driving at is this. The specific characteristics of things are not entities but distinctions in the nature of things; and these distinctions are translated into universals or logical ideas in our mind. Now when these logical ideas are taken apart from the reference of cognition in which they reveal the specific characteristics of things they are mere logical contents sustained by the mind yet having no concern with existence. Those who forget their cognitive use forget existence.

Now because we, the knowers, are also existents, this sense of existence is deepened by our feeling of our own activities and purposes. This is the reason why voluntarism—when properly understood—has always checked extreme rationalism. Voluntarism has expressed a fuller sense of reality than external cognition alone could grant us. Of course, this does not mean that we must naïvely read into nature at the inorganic level our feelings and volitions, as analogical panpsychism has tended to do.

I have argued, then, *that cognition has an existential context* expressed in such a category as thinghood or existence. As I understand it, all the critical realists are at one here. Thus Strong speaks of a sensibly mediated intent, Santayana of animal faith, myself of an interpretative affirmation. We respond to the things which are stimulating us at the level of perception.

But there has been much misunderstanding of a phrase we have used. I have said, for instance, that we cannot intuit the stuff of things. What does this mean? It is simply a way of calling attention to the nature of our actual knowledge of objects. In knowing, we grasp interpretatively the characteristics—for instance, the structure, relative size and mass, the ways of behaving—of things; but we cannot literally get over to, and absorb or sample, the things themselves. We know objects, but we cannot be them or have them materially in our minds. Thus this expression was not meant as a declaration of agnosticism but as an indication of the nature of human knowing as mediated by logical ideas.

Naïve realism, because it accepts sensory qualities, is led to what I might call an inspectional view of knowing. It seems that we are aware of the literal surface of things. Now the critical realist is led to refine the predicates in terms of which we think things until this surface-quality is relinquished. In this it is one with science. Knowing finally turns out to be a grasping of the structure, composition, relative sizes, connexions and behaviour of things rather than of sensory qualities. Thus all temptation to a literal inspection of things vanishes. We assuredly know objects, but we now better realise what knowing is and what it grasps. We may say that, after its kind, human knowing has no fixed limits. It can explore and decipher the characteristics of physical systems as far as man's patience and technique will carry him. But such knowledge cannot transform itself into something else. It can never become the equivalent of being. Self-existence, or substantiality, is the ontological context which knowing presupposes.

What, then, are characteristics? And what is their relation to physical systems? I think that it is best to follow the detailed categories of thought as this is directed to things. We think things as structured, extended, behaving, massive. Surely we must regard these categories as giving us specific insight into the very nature of things. These determinations are not stuck on a blank substratum; they arise out of, and are intrinsic to, determinate things. And we cannot get nearer to things than their determinations or nature. Being is a that-what.

## VII.

In this concluding section I wish to examine very briefly three things: (1) the distinction between primary and secondary qualities; (2) the position of panpsychism; and (3) the substitution of the category of event for that of substance.

I should hold that there is no good reason to retain—and many reasons against retaining—what I should call sensory, qualitative predicates in our thought of external things. These must be taken up into a more critical judgment which brings out the fact that they are functions of many conditions and cannot be so reformulated that they give insight into the external object. The external event with which colour, *e.g.*, can be correlated seems of the nature of an electronic vibration.

Size, shape, structure and behaviour predicates seem to be not sensory in a qualitative sense so much as formal and relational. Critical realism points out that such predicates are revelatory of the characteristics of things but need refinement and development before we accept them as adequately interpretative of things. This development is carried through by science. A critical predicate gives not an intuition of the absolute size of an object—an ideal that perception at first suggests—but a ratio which is yet significant for the object.

It seems to me that we must distinguish between the characteristics of an object, which must be specific and intrinsic, and the terms in which we formulate and estimate those characteristics. To say that an object is five feet long is a very indirect way of getting at the size of an object, and yet it must give us something of the nature of a revelation of the actual size of the object. It must enable us to think the object clearly. I have argued in many places that the so-called primary qualities are really those characteristics of objects which are in some measure reproducible in our mind in an abstract way. Thus the pattern of things is

reproducible in different media. The *form* of the cause can appear in the effect, whereas passive qualities would have no way of reproducing themselves.

It should be noticed, then, that I would not speak of *primary qualities* but of intrinsic characteristics.

I might point out in this connexion that the essence wing of critical realism, while they have usually asserted their belief that colours and flavours are not a part of the essence of the object, have never clearly explained why this class of essences are never embodied in objects. In other words, they have never gone far into the logic of science. Perhaps it is because of this that many younger thinkers are following Whitehead instead.

We come now to panpsychism and neutral monism. It will be recalled that I denied the necessity of starting with ontological dualism. It has always been my argument that the knowledge gained by the so-called objective sciences—those sciences depending upon the facts of perceptual observation—was limited to the characteristics so revealed. In other words, I denied that such knowledge participated in the content of being. But, so I have held, in consciousness we are literally on the inside of being in the case of our brains. *Consciousness is a qualitative dimension of being characteristic of this high level of emergent evolution.* I have called this the double-knowledge approach to the mind-body problem.<sup>1</sup>

It is, I think, fair to point out that Mr. Russell has adopted this position lately without, apparently, any awareness of my priority. I would also point out that this position cannot be connected with the neutral-monism view because the epistemology is entirely different. Mr. Russell has been swinging to my form of critical realism and away from the view that sensations are neutral entities having an external status, as in his *Analysis of Mind*. His old view was, of course, a development of James's radical empiricism.

The older panpsychism was analogical and agnostic. It was reared on a theory of unknowable things in themselves. Recently Strong and Drake have devised a doctrine which makes sentience an almost unknowable mind-stuff (but how does it deserve the name sentience?) while consciousness with its contents are *appearances*. "All the data of consciousness," writes Drake, "are mass-effects, products of 'fusion'." It is an ingenious doctrine of motor reaction which leads to the

<sup>1</sup> Sellars, *Evolutionary Naturalism*, ch. xiv.; *Aristotelian Society Proceedings*, 1922-3. *Critical Realism*, ch. ix.

strange awareness of what is not there. *There is a fusion which is an illusory fusion, and not a cerebral integration.*

I have great admiration for the ingenuity of the doctrine. But I myself believe in actual integration with intrinsic, emergent novelties. All levels of the psychical seem to me to be such intrinsic novelties, of the nature of a qualitative dimension within the brain-mind. As to the content of being at lower levels, I have no first-hand information. Thus my theory of knowledge excludes any form of naïve materialism.

It is important to note that the Drake-Strong doctrine of essences, which are not mental but are appearances somehow intuited, goes with their theory of consciousness as against mind-stuff. I, on the other hand, hold that logical ideas are discriminations within the act of cognition intrinsic to the cerebral response, which is, itself, a part of the whole organic response to the object.

Last of all, I come to the doctrine of events. Why substitute this category for that of a substantial system within which events occur! I must confess that the motives of Russell and Whitehead seem to me connected with a rejection of the permanent core, or substratum, view. I certainly would not hold matter to be changeless. I would introduce the notion of activity into the very heart of being. And yet I still feel that the term event does not furnish a suitable category for such *systems* as minerals and organisms. Where is the idea of system, of organisation? And Russell still seems to me to want to identify things with logical constructions. At heart, he is not yet a frank physical realist.

In a recent review in *MIND* of my book, *The Principles and Problems of Philosophy*, Miss Stebbing took occasion to say that she did not quite understand my view of substance. This article is meant as an explanation.



## V.—COSMOLOGY IN PLATO'S THOUGHT (I.).

BY J. E. BOODIN.

AFTER venturing a cosmology of my own, as a result of many years of laborious research,<sup>1</sup> I had occasion to re-read Plato's *Timæus*. To my great surprise, I discovered Plato's foot-prints everywhere over the ground that I had traversed. It was like Captain Scott getting to the South Pole and finding Amundsen's flag (though we must remember that Amundsen and Scott did not cover the ground in the same way). Perhaps I was biased by my interest. But we are all biased by our interests. There is no absolutely neutral interpretation. I was led to take a fresh survey of Plato to see how the *Timæus* connects with Plato's development, so far as we can trace it in the dialogues; and became convinced that the cosmological point of view is fundamental in Plato's thought and that the *Timæus* was merely an attempt at articulate statement of a conception of reality which had been forming in Plato's mind during his whole constructive period, as distinguished from the period in which he was completely dominated by the personality of Socrates. In fact Plato's cosmological theory is, I think, his most distinctive contribution and places him in the distinguished succession of Greek naturalists. The *Timæus*, far from being the curious resurrection (for no particular purpose) of an obscure fifth century Pythagorean (as A. E. Taylor supposes), is the consummation of Plato's teleological speculation. I realize that it is audacious to enter a field which has been traversed by so many famous Greek scholars, but community of interest may furnish a better insight into the mind of Plato than minute technical learning, biased perhaps by a foreign tradition. It may be said of others more truly than of St. Paul: "Much learning hath made thee mad". It was Plato's theory that we see truth by the mind and not by mere details of sense nor mere halting opinion. And I shall try Plato's theory on his own philosophy.

We have sufficient direct evidence that Socrates had no

<sup>1</sup> *Cosmic Evolution*, Macmillan, 1925.

interest in cosmology. In the *Apology* Plato makes Socrates refute the popular misunderstanding that he is "a curious person, who searches into things under the earth and in the heaven".<sup>1</sup> Socrates has no difficulty in finding witnesses to prove that he has "nothing to do with these studies". He speaks of such knowledge with Socratic irony as "super-human wisdom". We have Xenophon's testimony to the same effect. Socrates "did not dispute about the nature of things as most other philosophers disputed, speculating how that which is called by the Sophists the world was produced, and by what necessary laws everything in the heavens is effected, but endeavoured to show that those who chose such objects of contemplation were foolish; and used in the first place to inquire of them whether they thought that they already knew sufficient of human affairs, and therefore proceeded to such subjects of meditation".<sup>2</sup> He pointed to the contradictions of the natural philosophers to show that it "is impossible for man to satisfy himself on such points". Aristotle's testimony in regard to the interest of Socrates confirms that of the *Apology* and Xenophon: "Socrates, however, was busying himself about ethical matters and neglecting the world of nature as a whole but seeking the universal in these ethical matters and fixed thought for the first time on definitions".<sup>3</sup> Socrates, according to Aristotle, stopped with definitions. He did not hold to the Platonic ideas.

Socrates is a typical fifth century sophist, like Protagoras concerned with human things and orthodox in his attitude to the popular religion. He believes in the godhead of the sun and moon. He accepts the oracle of Delphi as his authority and worships the gods in accordance with the laws of the land, without speculating about the gods. He has, moreover, an oracle of his own which he obeys absolutely. Socrates' scientific method exists in a different compartment from his religion. His scientific interest is in human nature; and through his new method of conceptual analysis, he becomes the creator of utilitarian ethics. This requires for him no speculative setting. The Pythagorizing of Socrates was posthumous. Socrates differed from the older sophists not in interest but in method. This method could not be confined

<sup>1</sup> *Apology*, 19, Jowett's translation. I have quoted Jowett's translation except when too obscure.

<sup>2</sup> Xenophon's *Memorabilia*, I. 2, 64.

<sup>3</sup> *Metaphysics*, 987C, Ross's translation. I see no reason for supposing that Aristotle misrepresents Socrates. He does not understand Plato because he is not a mathematician like Plato. But he is more closely akin to Socrates mentally than Plato is.

to the limits fixed by Socrates for himself, and his accusers probably had the true instinct about the danger of this method to conventional religion and institutions. Unwittingly Socrates, moreover, gave a new content to religion in his own life.

*The Development of Plato's Cosmology.*

Plato's young mind is naturally dominated by his reverence for Socrates. The ethical interest becomes pre-eminent for him too and remains so throughout his life. He accepts at first Socrates' method of induction from concrete instances to arrive at a common definition. But Plato discovered a new method—the method of limits.<sup>1</sup> Whether he was led to this discovery by his mathematical interest or his ethical interest does not matter. It is equally applicable in either field. Mathematical ideals are never realized in the concrete world of existence. We find various curves, but we do not find straight lines or perfect circles. For the mind which has grasped the ideal, the lines which we draw are approximations and symbols, but the ideals must be grasped by creative intelligence, they cannot be perceived by sense. The same holds of the good and the beautiful. The good life is not completely realized in existent society or existent individuals. The perfect life, then, cannot be a generalization from existent lives. It must, like the mathematical ideals, be grasped by creative intelligence. Its significance does not derive from the varying existent lives, but these owe their significance to their approximation to the perfect. The convincingness of Plato's argument for the reality of the world of structure depends upon the qualitative distinction between the method of reason and that of opinion which proceeds from particulars. Reason grasps "principle which is above hypothesis, making no use of images, . . . but proceeding only in and by the ideas themselves," "not the visible forms, but the ideals which they resemble, . . . the absolute square and the absolute diameter, . . . really seeking for the things, which can only be seen by the eye of the mind,"<sup>2</sup> as contrasted with the tentative form of knowledge which is gained by perception and opinion. "If mind and true opinion are two distinct classes, then I say that there certainly are these self-existent ideas unperceived by sense, and apprehended only by the mind."<sup>3</sup>

<sup>1</sup> Limit is here used in the sense of modern mathematics, not the Pythagorean sense of the limit as opposed to the unlimited.

<sup>2</sup> *Republic*, Bk. VI., 510.

<sup>3</sup> *Timæus*, 51.

It was Plato's discovery of degrees and of limit which made it impossible for him to stop with the Socratic concept. If form were completely immanent in the concrete individuals, inductive generalization would be sufficient. But there is another type of similarity, Plato tells us in the *Phædo*,<sup>1</sup> than that which suggests identical qualities in individuals, and which is employed in generalization, namely similarity which suggests defect and approximation. For this type of relation another method is required. Aristotle never understood the method of limits. Hence Plato's ideas for him are merely hypostasized abstractions. He goes back to the Socratic method of induction. The form is conceived as immanent in individuals and must be predicated of individuals who are the real substances. "Nature works by a law immanent in itself." But Aristotle is not consistent. While nature "is always striving after the most beautiful that is possible," she is not quite successful. In the world of change, form is never completely realized. But what sort of immanence is it which is not quite immanent? The Stoics were the only consistent immanentists and that meant pantheism.

In the *Symposium*, Plato has become definitely conscious of the implications of the new method and of the difference between his conception of ideas and that of Socrates. Seeing that it was inappropriate to make Socrates the spokesman for the new doctrine, Plato introduces the mythical Diotima to instruct Socrates. Socrates was familiar with the lesser mysteries—temperance and justice as they are concerned with states and families—but he knew nothing about beauty, "absolute, separate, simple, and everlasting,"<sup>2</sup> which reveals itself in the perishing beauties of earth and is suggested by them but which has a status of its own. So far from the principle of beauty being derived from the concrete changing things of perception, we must understand these through it. It can be contemplated by the mind only. It is the source and inspiration of creative activity. Our education in beauty must start, it is true, with the appreciation of beauty in the concrete, as our study of geometry starts with concrete figures, but this becomes merely symbolic of the true beauty. This absolute beauty is imparted somehow to the world of perception. It is when by an act of creative thought we grasp the limit, the integral of the series, that we can understand the grades of approximation—perception, opinion, science, institutions—but we cannot derive the limit from the series. The limit integrates the series. If we disintegrate

<sup>1</sup> *Phædo*, 74.<sup>2</sup> *Symposium*, 211.

the integral, to use modern language, we can never arrive at it by analytical steps. It is a synthetic act, and the comprehension of the series is a synthetic act.

The method of limits points in a different direction from the method of generalization. The limit has a dignity superior to that of the approximations. It is the limit which has "being" *par excellence*. But does the limit—the straight line, the perfect circle, the structure of beauty—exist merely in our mind? Or does it have existence in nature, independently of our mind? The subjective question probably did not occur to Plato. The mind grasps the limit as objective, as legislative. Since such is the case, how does the limit exist in nature? Certain it is that the limit, the idea, exists independently of the concrete temporal imitations. It is not presented to sense, but must be grasped, if at all, by creative thought. But while "there certainly are these self-existent ideas unperceived by sense and apprehended only by the mind,"<sup>1</sup> what is their status in reality?

The teleological conception of the good (which Plato adopts from Socrates) and the method of limits conspire to force Plato into cosmology. Socrates' conception of cosmology as "supernatural wisdom" forbidden to man, makes Plato hesitate to make the venture into cosmology. But if the world of being—the world of structure, of meaning and worth—is to be understood in terms of ends or purposes, and if it cannot be projected merely on the plane of human experience as Socrates had done, reality must somehow have a teleological structure. With Plato's teleological background it was impossible for him to divorce being from soul and mind. A teleological cosmology is called for. But there can be no universal teleology unless it can be shown that there is a cosmic creative genius which plays the rôle on a large scale that our mind plays on a small scale in art and society. If we could see the universe from the point of the Creator, we should understand all. For we can only understand truly when we understand as the Creator understands, as St. Thomas Aquinas pointed out.

While Plato was hesitating on the threshold of cosmology, he discovered Anaxagoras. The enthusiasm with which Plato makes Socrates speak in the *Phædo* is entirely inconsistent with an autobiography of Socrates, who is too anxious to prove that he never concerned himself with cosmology and who had a religious prejudice against it to the end of his life. Can we imagine Socrates, with his prejudice against natural

<sup>1</sup> *Timæus*, 51.

science, feeling the thrill that Plato felt? As a confession by Plato it throws light upon his whole subsequent philosophy. It is not necessary to suppose that Plato had never heard of Anaxagoras' book before, but we never discover another man's thought until our own research leads us in the same direction. We may be sure that Socrates had not encouraged the reading of Anaxagoras, for to Socrates the teaching that the "moon is earth and the sun is a red hot stone" must have seemed impiety. At any rate Plato had a real thrill when he learned that Anaxagoras had been working at the same problem and that he had made mind, *Nous*, a cosmic principle, responsible for the order of the world.

So Plato bought the book and read it eagerly. It began well: "*Nous* had power over all things, both greater and smaller, that have life. And *Nous* had power over the whole revolution, so that it began to revolve in the beginning. And it began to revolve at first from a small beginning; but the revolution extends over a larger space and will extend over a larger still. And all the things that are mingled together and separated off and distinguished are all known by *Nous*. And *Nous* set in order all things that were to be and that were, and all things that are not now and that are, and this revolution in which now revolve the stars and the sun and the moon, and the air and the ether that are separated off."<sup>1</sup> Surely a splendid promise. Now he would show, thought Plato, that "if mind is the disposer, mind will dispose all for the best, and put each particular in the best place."<sup>2</sup> But Plato's hopes were grievously disappointed: "As I proceeded, I found my philosopher altogether forsaking mind or any other principle of order, but having recourse to air, and ether, and water, and other irrational things."<sup>3</sup> Anaxagoras' *Nous* was too thin and impersonal for Plato. Anaxagoras had lost sight of the ultimate causes in the secondary causes.

What Plato required was a teleological cosmology. He wanted to arrive at a conception of the ultimate cause or reason (*αἴτιον*, Ursache or rather Zweckursache) which disposes with a view to the good. "This is the principle I would fain learn if anyone would teach me. But as I have failed either to discover, or to learn of anyone else, the nature of this principle or its working, I will show you what I have found to be the second best mode of enquiring into the cause."<sup>4</sup> It is plain that Plato realized when he wrote the *Phædo* that the cosmological approach is the only true approach, if we

<sup>1</sup> Fr. 6, Burnet's translation.

<sup>2</sup> *Phædo*, 97.

<sup>3</sup> *Ibid.*, 8.

<sup>4</sup> *Ibid.*, 99. I am indebted here to Kurt Hildebrandt's translation.

would understand reality; and that cosmology must be conceived teleologically as the creative activity of the supreme genius who works to realize the fairest and best. He did not find a satisfactory cosmology and was not ready to suggest one. But his mind was at work on the problem. Like young Hume he had made notes, at least mentally, towards a natural theology. More than that, the cosmological approach is ever with him, as is apparent from hints in various dialogues.

A short cut would have been mysticism—the contemplation of the inexplicable, the adoration of the unknowable. But that would have been losing “the eye of the soul”.<sup>1</sup> Plato is looking for the intelligible, not for an emotional intoxication. He, therefore, chooses as the field of investigation the realm of structure. Without being able to account for the structure of the cosmos, we can investigate the nature and implications of ideas. Plato describes his method: “This was the method which I adopted: I first assumed some principle which I judged to be the strongest, and then I affirmed as true whatever seemed to agree with this, whether relating to the cause or anything else; and that which disagreed I regarded as untrue”.<sup>2</sup> What Plato did was what Descartes did. He tried to arrive at an idea which seemed indubitable—clear and distinct. Then he developed the implications of that idea. It is the method of geometry to which both Plato and Descartes contributed. It is the method pursued by E. V. Huntington in developing a geometrical system from the concept between. But the ancient geometricians, including Euclid, felt that they were investigating nature, while the modern geometricians are concerned merely with logic. Until Einstein came on the scene, it seemed that Euclidian geometry was the geometry of nature. But now it is regarded merely as a system of logic. For Plato the investigation of the implications of ideas is an investigation of the structure of reality.

While Plato approaches reality through the investigation of structure—ideas, forms, meanings—he denies emphatically that he is farther from reality than he “who turns to the immediately given things.”<sup>3</sup> On the contrary he who deals with things as they appear is farther away from reality than he who interprets phenomena from the point of view of structure. In the *Sophist* Plato contends against those who

<sup>1</sup> *Phædo*, 99.

<sup>2</sup> *Ibid.*, 100.

<sup>3</sup> “Welcher sich unmittelbar an die gegebenen Dinge wendet,” Kurt Hildebrandt, *Phædo*, 100.

"maintain that only the things which can be touched or handled have being or essence, because they define being and body as one, . . . and will hear of nothing but body."<sup>1</sup> We can never by the senses attain to a grasp of structure, we can only arrive at opinion—tentative guesses, probability. If we start with structure we can see that the world of perception participates in the world of structure in that the former expresses structure in however broken a way, as language is a medium for expressing ideas, though an inadequate medium. But the sensible world is not separated from the intelligible. The world of appearances suggests structure to a mind which creatively apprehends structure. Thus in the *Symposium* the world of perception, the world of scientific hypothesis and the world of institutional organization suggest progressively the limit—the absolute beauty. They would not suggest it to creative intelligence, if they did not by degrees reveal it, spite of the distortion of the medium, as the rays of moonlight are revealed on the ruffled mirror of the lake.

There can be no doubt that Plato had set himself a legitimate field of research; and by pursuing it he not only furthered the logic of geometry but was largely instrumental in laying the foundations of logic itself. But there are dangers in the method. There is the danger that an idea which seems indubitable may seem so because of "the intellectual climate" (to use a phrase by William James). It may not prove indubitable to others. Thus the Platonic circle assumed as indubitable "that there is an absolute beauty and goodness, and greatness and the like".<sup>2</sup> Things therefore are beautiful only so far as they partake of absolute beauty. Such ideas have not seemed indubitable to other thinkers. There is the further danger that there may be error in developing the implications of an idea. Plato was conscious of both dangers: "First principles, even if they appear certain, should be carefully considered; and when they are satisfactorily ascertained, then, with a sort of hesitating confidence in human reason, you may, I think, follow the course of the argument."<sup>3</sup> There is a still greater danger when it is assumed that the investigation of the implications of ideas is an investigation into the structure of nature. This danger is illustrated by Plato's use of the principle of implication in order to prove the immortality of the soul. If we assume the eternity of the principle of life, and if the soul participates in the principle of life as the individual number, three, participates in oddness, so that the soul always brings life with it

<sup>1</sup> Sophist, 246.<sup>2</sup> *Ibid.*, 100.<sup>3</sup> *Ibid.*, 107.



as three brings oddness, then the soul must be immortal. But if we doubt the eternity of the principle of life or doubt the analogy of the soul to numerical individuals, then the argument fails. In the *Timæus* Plato makes it clear that it is not enough that an hypothesis in regard to nature is aesthetically satisfying. It must also be capable of standing the pragmatic test.

On one thing Plato is clear from the *Symposium* to the end; and that is that the structure of nature can be grasped only by creative intelligence. In this Plato is in substantial agreement with the great naturalist, Democritus, who holds that it is only by the organ of reason that we can know the ultimate nature of things. We can never attain to such knowledge by custom which stops with the appearance of the senses, though the senses, according to Democritus, may retort: "Poor mind, it is from us thou hast got the proofs to throw us with. Thy throw is a fall."<sup>1</sup> However, what Democritus regards as the arrangement in nature, Plato regards as "order only by accident." It does not follow from principle. We must, I think, agree with Plato, that the structure of nature can be grasped only by the mind. The two great structural hypotheses of present science are the best vindication of Plato. I am referring to Clerk Maxwell's electromagnetic theory and Einstein's general theory of relativity. Neither theory was an induction from evidence, but rather an anticipation of evidence. Bertrand Russell thinks that the grounds which Clerk Maxwell gives for his theory are so flimsy that he must have arrived at his equations by intuition. And Einstein's theory is a marvellous prediction of evidence which could of course not be looked for until the theory was complete. Both thinkers were doubtless stimulated by the logic of scientific development. But the creation itself was an act of intuitive genius. It was in the Platonic spirit and in Platonic language that Einstein is said to have replied to the reporters who were eager to get his reaction to the news that a two hundred inch reflecting telescope was to be erected in California: "Not the eye but the spirit furnishes the proof of theories—and that errs most of the time." Plato and Einstein would agree that the spirit is far from inerrant, but by it alone can we divine the structure of nature. Mere induction from particulars can furnish us only statistical averages. But statistical averages are a poor substitute for creative genius.

If it is by intuition that the mind divines the structure of

<sup>1</sup> *Greek Philosophy—Thales to Plato*, John Burnet, p. 198.

nature, how can we account for the intuition? Plato in the *Phædo* refers in mythical fashion to the explanation by recollection from previous existence. But this merely pushes the problem further back. The structure of mind which leads it to create structure—logical structure, æsthetic structure, ethical structure—must be due to reality itself. The metaphysical bent of Plato's mind is too strong for him to stop with the consideration of abstract structure. Other minds have found this a satisfactory stopping-place. But Plato must press on to consider the rationale of the structure of the human mind—the source of its intuitive creativeness.

In the *Phædrus*, Plato is conscious that the investigation of structure is an investigation of reality, not a subjective nor a merely formal procedure. "If I find any man who is able to see unity and plurality in nature, him I follow, and walk in his steps as if he were a god."<sup>1</sup> He is now able to give a realistic explanation of intuition or "recollection". In a mythical way he shows that the mind's intuition of structure is due to rapport with the structure of reality. "The colourless and shapeless and intangible essence is visible to the mind, which is the only lord of the soul."<sup>2</sup> The mind when liberated from the thralldom of material interests through rigid moral discipline has first-hand experience of the limit. "Of beauty, I repeat again, that I saw her there shining in company with the celestial forms." And having grasped structure with the mind and "coming to earth we find her here too, shining in clearness through the clearest aperture of sense. For sight is the clearest aperture of our bodily senses."<sup>3</sup>

The appreciation of beauty seems to Plato in the *Phædrus* to be the most convincing experience of ultimate structure. "Beauty only has this portion that she is at once the loveliest and the most apparent." But we must have the intuition of absolute beauty before we can grasp beauty in the concrete world. The mind must have structure to recognize structure. It is because the mind brings the sense of structure that it can discover structure by induction. "Man ought to have intelligence, as they say, 'secundum speciem,' proceeding from many particulars of sense to one conception of reason; and this is the recollection of those things which our soul saw when in company with God—when looking down from above on that which we now call being and upwards towards true being."<sup>4</sup> Like Kant Plato sees that mind must bring struc-

<sup>1</sup> *Phædrus*, 266.

<sup>3</sup> *Ibid.*, 250.

<sup>2</sup> *Ibid.*, 247.

<sup>4</sup> *Ibid.*, 249.

ture to experience in order to discover structure. But Plato shows his superior sanity in realizing that the structure of the human mind cannot be conceived in isolation from reality, but must be understood in community with reality. It is ontological structure which the mind intuits; and the discovery of structure, so far as it is true discovery, is the discovery of real structure.

Plato recognizes that it is in the realm of ontological ideals that the mind finds God. In the *Symposium* he tells us that it is in the life of creative communion with absolute beauty that man becomes the friend of God and becomes immortal, if mortal man may.<sup>1</sup> In the *Phædrus* he tells us that the philosopher "is always, according to the measure of his abilities, clinging in recollection to those things in which God abides,"<sup>2</sup> and in beholding these things the mind is assimilated to God—a conception to which Plato recurs in the later dialogues. It is in our striving for ideals that we become God-conscious. This implies that God is the perfect embodiment of ideals. But there is no hint in the *Phædrus* of God as creator.

Plato, however, has taken a distinct step towards a cosmology in making the soul the ultimate cause of motion. This step is taken not in the interest of theology but in the interest of immortality. "The soul is immortal, for that is immortal which is ever in motion; but that which moves and is moved by another, in ceasing to move ceases also to live. Therefore, only that which is self-moving, never failing of self, never ceases to move, and is the fountain and beginning of motion to all that moves besides. Now the beginning is unbegotten, for that which is begotten has a beginning. . . . But that which is unbegotten must also be indestructible; for if the beginning were destroyed, there could be no beginning out of anything, or anything out of a beginning, and all things must have a beginning. And therefore the self-moving is the beginning of motion; and this can neither be destroyed nor begotten, for in that case the whole heavens and all generation would collapse and stand still, and never again have motion or birth."<sup>3</sup> It will be seen that having started to prove the immortality of the soul from its self-movement, Plato is swept on by his imagination to make the soul the only principle of motion and therefore the ultimate cosmic principle of motion. In the *Timæus* he recognizes with the naturalists that matter itself has the property of motion, but in the *Laws* he comes back to the *Phædrus*. It should be

<sup>1</sup> *Symposium*, 212.

<sup>2</sup> *Phædrus*, 249.

<sup>3</sup> *Ibid.*, 245.

noted that in the *Phædrus* it is soul, and not mind, which is the originator of motion, as contrasted with Anaxagoras in the *Phædo*. Mind is now conceived as "the sole lord of the soul". We have the idea in germ that mind must exist in soul to be effective. This is the presupposition of the later dialogues. In the *Timæus* the relation is stated in terms of creation. God put mind in soul and soul in body. It must be clear now that Plato has made considerable advance in his cosmological speculation from the *Phædo* to the *Phædrus*. The logic of his system required a cosmology. The intuition of structure in the mind must be accounted for. And this meant accounting for the relation of mind and soul to the cosmos.

In the *Theætetus* Plato for the first time in the history of western philosophy (as Burnet points out) explicitly introduces God as a philosophic principle and for him the ultimate principle. "In God is no unrighteousness at all—he is altogether righteous. . . . To know this is true wisdom and manhood, and the ignorance of this is too plainly folly and vice."<sup>1</sup> Henceforth Plato's philosophy becomes theocentric. The mystical God of Socrates has become the basic philosophic principle. Plato now conceives of the pattern of the good life as existing in nature: "There are two patterns set before them in nature; the one, blessed and divine, the other godless and wretched; and they do not see in their utter folly and infatuation that they are growing like the one and unlike the other, by reason of their evil deeds; and the penalty is, that they lead a life answering to the pattern which they resemble."<sup>2</sup> But Plato does not throw any light in the *Theætetus* on the relation of the pattern in nature to God.

In the *Republic*, Plato affirms explicitly and emphatically that the teleological point of view is the only true point of view. This is now spoken of as a familiar point of view. "For you have often been told that the idea of good is the highest knowledge, and that all other things become useful and advantageous only by their use of it."<sup>3</sup> This idea is innate in the sense that every one has "a presentiment that there is such an end" and that every one in his heart seeks to realize it, not being satisfied to possess the appearance as with many other things, including even justice and honour, but wanting the reality. But while every one has a presentiment of this end, few possess true insight. Those that have the "true notion without intelligence," are

<sup>1</sup> *Theætetus*, 176.<sup>2</sup> *Ibid.*, 176.<sup>3</sup> *Republic*, 505.

"only like blind men finding their way along a straight road".<sup>1</sup> It is of the utmost importance that those who are guardians of the state should be clear about this first principle. Socrates declines, however, to enter into an analysis of "the actual nature of the good, for to reach what is in my thoughts now is too much for me in my present mood".<sup>2</sup> Socrates' soul must go marching on for some years yet, before he attempts such an analysis in the *Philebus*.

Without entering upon a logical analysis of the good, we can grasp its significance from a functional point of view. We can know "the child of the good". We can see its relation as the first principle to the whole hierarchy of ideas and activities which get their value and meaning from it. "Now, that which imparts truth to the object and knowledge to the subject is what I would have you term the idea of good, and that you will regard as the cause of science and of truth as known by us."<sup>3</sup> Since the ultimate question must always be: Is it worth while? therefore that which is conceived as making any idea or activity worth while takes precedence. It has a place higher than truth and knowledge. It is more beautiful than either, for everything derives its beauty from it. There is a close affinity between the idea of the good in the sixth book of the *Republic* and the idea of beauty in the philosophic poem of the *Symposium*. In either case the limit makes significant the series of approximations. The good is always the most beautiful, though Plato does not say in the *Republic* that the idea of beauty exhausts the good. In either case we must remember that we have to do with objective structure. The idea of the good in the *Republic* is the structure of the real world. To grasp the meaning of the world is to see it from the point of view of the good. And there is a pattern laid up in heaven of the good state. The rulers of the state must be philosophers because they must have a grasp of what is for the best.

I do not think there is anything mystical about Plato's idea of the good in the *Republic*. Since the idea of the good is the first principle, everything is subordinated to it. But the good is not something occult as the Neoplatonists supposed. We are told that the Socratic principle "that the good is the useful" is "the best of sayings". Plato is consistent throughout his dialogues that "the good is what profits men". The structure as well as the content of the good can be grasped by reason. Reason can rise to the first principle "by the power of dialectic, using the hypotheses not

<sup>1</sup> *Republic*, 506.<sup>2</sup> *Ibid*, 506.<sup>3</sup> *Ibid*, 508.

as first principles, but only as hypotheses—that is to say steps and points of departure into a region which is above hypotheses, in order that she may soar beyond them to the first principle of the whole; and clinging to this and then to that which depends on this, by successive steps she descends again without the aid of any sensible object, beginning and ending in ideas”.<sup>1</sup> Plato assumes that the teleological hierarchy of ideas is also a logical hierarchy, though he does not work out the details. He maintains further “that knowledge and being which the science of dialectic contemplates, are clearer than the notions of the arts, as they are termed, which proceed from hypotheses only”. The statesman, moreover, “must raise the eye of the soul to the universal light which lightens all things, and behold the absolute good; for that is the pattern according to which they are to order the state and the lives of individuals, and the remainder of their own lives also, making philosophy their chief pursuit”.<sup>2</sup> Plato believes that we enter most fully into reality when we are most fully awake, not when we go into a trance. We are most sane when we see things from the point of view of the whole and this for Plato means to see things from the point of view of the good, or what is best. The later mysticism has its origin in a fateful metaphor. Plato compared the idea of the good to the sun. The analogy is that as the sun is the author of the visibility of all things in the world of sense, so the idea of the good makes meaningful everything in the world which mind contemplates. This is only a metaphorical way of saying that the idea of the good is the first principle or that reality is ultimately teleological. So far from the relation of the idea of the good to that below it being mystical, it is supposed by Plato to be a relation of strict logical implication. That Plato should wax enthusiastic about his first principle is not to be wondered at. It was through the conception of the good that Socrates by a stroke of genius had created the science of Ethics—the first science to be created. This principle had shown a marvellous power of bringing clarity and unity into the motley facts of human life. For Plato the idea of the good would explain with equal clarity the seeming confusion in the cosmos could we follow its implications. If Kant is unable to refrain from apostrophizing the abstract concept of duty, certainly Socrates or Plato has a right to apostrophize the first scientific principle discovered by man and the most practical—the idea of the good.

<sup>1</sup> *Republic*, 511.

<sup>2</sup> *Ibid.*, 540.

There is another sense in which Plato—carried away by his metaphor—uses the good, namely as the creative agent and not merely the first principle. As “the sun is not only the author of visibility in all visible things, but of generation and nourishment and growth, though not himself a generation, . . . in like manner the good may be said to be not only the author of knowledge in all things known, but of their being and essence, and yet the good is not essence but far exceeds essence in dignity and power”.<sup>1</sup> The *idea* of the good, Plato points out, may be called the essence of the many good. When he makes the good the creator of essence he cannot have in mind the idea of the good. Socrates stops short in the sixth book, recognizing that his enthusiasm has carried him beyond the argument. But in the tenth book we are told that God is the creator of all the patterns in nature—of the bed and the table and all other patterns.<sup>2</sup> And they are all created for the good. What is the relation of the good to God?

According to the second book of the *Republic*, “God is always to be represented as he truly is”. He is to be represented therefore as “truly good”. And “the good is the advantageous” and “the cause of well-being”. But not everything that happens in our world is good. “The good is not the cause of all things, but of the good only, and not cause of evil.” We can now see the relation of God to the world as it is: “Then God, if he be good, is not the author of all things, as the many assert, but he is the cause of a few things only, and not of most things that occur to men; for few are the goods of human life, and many are the evils, and the good only is to be attributed to him; of the evil other causes have to be discovered.” Here God is defined as “truly good”; and the good and God are used interchangeably; but Plato does not expressly speak of the good and God as identical. It is to be noticed that in the *Republic* Plato takes a pluralistic view of reality. He has already in mind an “errant cause”.

What Plato's teleology required was a cosmic mind (and soul) which creatively gives order, beauty and worth to the changing world which we call existence. This conception he has suggested in the *Republic*. This conception of a cosmic artist he takes for granted in the *Sophist*, though it should be noted that it is new to the young interlocutor: “Let me suppose then that things which are made by nature are the work of divine art, and that things which are made

<sup>1</sup> *Republic*, 509.

<sup>2</sup> *Ibid.*, 598.



by man out of these are works of human art. And so there are two kinds of making and production, the one human and the other divine."<sup>1</sup> The divine artist creates the patterns which we try to express in material form.

The real antagonists, Plato now feels to be the materialistic naturalists who deny order and meaning in nature: "Looking, now, at the world and all the animals and plants which grow upon the earth from seeds and roots, and at inanimate substances which form within the earth, fusile or non-fusile, shall we say that they come into existence—not having existed previously—in any way but by the creation of God, or shall we agree with vulgar opinion about them?" The vulgar opinion is "that nature brings them into being from some spontaneous and unintelligent cause". Materialists to-day would say that they emerge. Plato's opinion, expressed through the Eleatic stranger, is that "they come from God, and are created by divine reason and knowledge".<sup>2</sup> He supposes that "we, and the other animals, and the elements—fire, water, and the like—are known by us to be the realities which are the creation and work of God".<sup>3</sup> In short nature is divine art and human art is "image-making".

Plato conceives of reality as a living dynamic whole. Even in the *Phaedo* where he despairs of cosmology and selects the study of structure—the implications of ideas—as his field of research, he regards this as a half-way house, a second best. The true view would be the cosmological creative point of view, if we could have it. But the logic of Plato had become formalism in the second rate minds which tried to follow him. It is one of the ironies of history that the creator of ideas should have to fight against his own creation. In the *Parmenides* Plato shows the futility of abstract ideas by setting the Eleatic formalists against the Pythagorean, like Kilkenny cats, to their mutual destruction. A more brilliant indictment of formalism has never been made. But Plato, unlike Bradley, does not fall into mysticism in which "all cows are grey". The alternative is a thorough-going ethical or aesthetic idealism. In the *Sophist* Plato proceeds more constructively to show the functional character of ideas. He is more tender toward those who contend that true essence consists in "intelligible and incorporeal ideas," existing apart, than to the materialists, for the former are of his own school. But he is none the less emphatic against separating ideas from the living whole: "And, O heavens,

<sup>1</sup> *Sophist*, 265.<sup>2</sup> *Ibid.*, 265.<sup>3</sup> *Ibid.*, 266.



can we ever be made to believe that motion and life and soul and mind are not present with absolute being? Can we imagine being to be devoid of life and mind, and to remain in awful unmeaningness an everlasting fixture?"<sup>1</sup> Nor can we separate the world of appearances, the world of change, from the world of structure. The latter reveals itself in the medium of the former, though it be as broken lights. This Plato had maintained from the *Symposium* on. Yet Plato had become identified in the minds of some of his own followers with formalism. The Academy continued the false tradition after Plato's death. Aristotle bases his criticism *ad nauseam* on this misconception. And the historic tradition has represented Plato's world of being as a world of abstract forms. When A. E. Taylor represents Plato as implying with Whitehead the impersonal ingression of abstract eternal objects into the world of events, he shows that he has missed the essential conception of dynamics in Plato which is always the activity of soul endowed with mind, in short is personal.

<sup>1</sup> *Sophist*, 249.

(To be concluded.)

## VI.—CRITICAL NOTICES.

*The Child's Conception of the World.* J. PIAGET. London : Kegan Paul, 1929. Pp. 394. 12s. 6d. net.

FOLLOWING on his studies of the form and functioning of the child's thought, Piaget turns in this volume to the actual content of the child's notions about the world. This content "may or may not reveal itself, according to the child and the nature of the representation in question. It is a system of intimate beliefs, and a special technique is required to track them down. Above all it is a system of tendencies and orientations of mind, of which the child himself has never become aware and of which he has never spoken"<sup>1</sup> (p. 2).

The first essential is therefore to examine the methods of inquiry, and Piaget devotes an important introductory chapter to the description of a new technique which he calls the 'clinical method,' and to a critical comparison of this with the method of tests and with pure observation. Upon the ultimate reliability of this technique rest the soundness and significance of his material and his conclusions. The method itself is of essentially the same order as that ordinarily used by psychiatrists as a means of diagnosis, and consists of sustained conversations with individual children. Piaget's original contribution lies in the special controls of question and of the interpretation of answer which adapt the technique to the study of the minds of young children. The topics introduced and the kind and form of question put to the child are based upon the spontaneous questions and reflections of children gathered in earlier investigations. It is this foundation in the child's spontaneous notions which gives the clinical method its advantage over the method of tests for this investigation. The good practitioner of the clinical method "lets himself be led, though always in control, and takes account of the whole mental context, instead of being the victim of 'systematic error,' as so often happens to the pure experimenter" (p. 8). On the other hand, this method brings out attitudes in the child which for one reason or another would not reveal themselves to pure observation.

The child's responses to questions fall into five types: the answer at random, romancing, suggested belief,<sup>2</sup> liberated belief and spontaneous belief. Only the two last are significant for an inquiry

<sup>1</sup> Reviewer's translation.

<sup>2</sup> *Croyance*. Translation gives 'conviction'.

into his conception of the world, and criteria for distinguishing these from the others are indispensable. Piaget offers the following, which serve also in his view to distinguish what is spontaneous and inherent in the child's thought from what is simply the imprint of the adult: The uniformity of the answers at the same average age, their continuous evolution with increasing age, the gradualness of their disappearance, their resistance to suggestion during the clinical examination, their proliferation and influence upon a number of neighbouring conceptions. These criteria seem to us to be very sound and significant. Whether they cover the ground sufficiently, leaving no loopholes for error, is a matter to which we shall presently return.

Using this method, Piaget inquires first into the child's notions about thought itself, about names and about dreams. With regard to these concepts, the child passes through certain definite phases of development. Up to 6-7 years, names come from things themselves, and are discovered by looking at the things. How did they know the sun's name? *Because it's bright.* But where does the name come from? *By itself.* Thinking is speaking, 'with the mouth' or 'with the ears'; there is nothing internal or subjective about it. This crudest confusion between the sign and the thing begins to fade at about 7-8, when thought is placed 'in the head' or 'in the brain'. It is now said to be 'the voice,' to be made 'of air,' 'of blood' and so on. Names are no longer found in their objects, but come gradually to be recognised as mere signs; at 9-10 they are localised in the head. This discovery that signs are distinct from the things they signify seems to lead on to the view that thought itself is internal, and presently, at about 11 years of age, to the view that it is immaterial.

Ideas about dreams show corresponding stages of development. Round about 5-6, the child believes that dreams come from outside, and refers them to the place dreamt of. The dream is made 'of night' or 'of light'. This dream realism is highly charged with affect—dreams come 'to pay us out,' 'because we've done something we ought not to have done'. At about 7-8, the source of the dream is considered to be in the head, in thought or in the voice; but it is still referred to the external world and placed in the room where the child is, in front of him. Only at about 11-12 is the dream fully subjective and immaterial in character, and referred to the inside of the head or the eyes.

Piaget is careful to say that he looks upon these notions of the child, not as explicit and systematised beliefs, but rather as implicit assumptions, spontaneous but unformulated *directions* of thought, which fall into shape only under the stimulus of the psychologist's technique. The child is thus shown to be a 'realist' (in the old scholastic sense), in his implicit modes of thought; for he fails to distinguish between the sign and the thing signified, the internal and the external, the psychical and the material. And his realism (Piaget holds) "is still further extended by 'participations' "

(Lévy-Bruhl's well-known term) "and spontaneous ideas of a magical nature" (p. 124). "Reality is impregnated with self," and hence: "From the point of view of causality, all the universe is felt to be in communion with and obedient to the self. . . . The desires and commands of the self are felt to be absolute, since the subject's own point of view is regarded as the only one possible. . . ." "There are thus two forms of egocentricity, the logical and the ontological. Just as the child makes his own truth, so he makes his own reality. He states without proof and he commands without limit" (pp. 167-8). Only gradually does he come to distinguish his own personal point of view from other possible points of view, and the self from the external world.

It is his assimilation of the world to personal schemas which gives rise to his animistic beliefs. In the earliest years, children take it for granted that everything which is in any way active is also conscious; later they come to think that only those things which move are conscious, and presently only those which move of their own accord (including the sun and the wind). Finally, consciousness is given only to the animal world. Parallel but not always coincident stages are found with regard to the notion of life; and it would appear that the evolution of the concept of life determines that of consciousness.

This early animism of the child is held to arise from the same factors as have led to his 'feelings of participation' and ideas of magic, and to be complementary to these. Later on it finds expression in the 'artificialist' beliefs of the child about the origin of the heavenly bodies, of the wind and water, of trees, mountains and the earth. The child takes it for granted that every object, natural or other, is 'made for' some purpose, defining things, as has often been remarked, by "*c'est pour . . .*". And this 'made for' passes by an easy and obvious transition into 'made by'. The child's ideas as to the birth of babies and the origin of man show the same direction. These 'artificialist' notions, like the ideas of magic and participation, arise from his personal and purposive schemas. His actual dependence upon his parents and his sense of their power, virtue and omniscience, together with his immediate experience of himself as a creative agent in excretory and manual activities, combine to set his mind in the direction of these assumptions as to the origin of natural phenomena.

The importance and interest of these contributions of Piaget can hardly be over-estimated. He has not only added greatly to our store of facts about the child's belief and ways of thought; he has gone far to show how these hang together as a coherent psychological whole. No psychologist can afford to pass by either the great mass of data which Piaget offers, or his theoretical mode of marshalling the facts. And the philosopher will do well to look at the transformations through which his favourite themes pass in the process of development, and the curious analogies of these with the history of thought, which Piaget brings out.

In the end, however, those of us who have had a close and continuous contact over varied fields with children of the ages in question find Piaget's picture not a little out of focus when judged by our own cumulative impressions. It does not seem to be a picture of the ordinary child as we know him in his ordinary moments and situations. Either—we feel—the ages have all by some error been put much too high, or the children examined were all well below normal in intelligence. For those children whom we know, even those of mere average intelligence, do show plenty of concrete understanding of causality, of reciprocal relations, of distinction between the self and the external world, both in the practical *and* in the verbal handling of experience. It is, of course, no refutation of Piaget's average level to be able to quote contrary instances—everything depends upon their number and their range. But some instances are so striking that they do seem to cut deeply at anything like a hard and fast picture of hard and fast stages. When for instance a boy of three, wanting to have his turn in a game with others, says first, "Now Tommy have it," and then laughs at himself and draws attention to what he has said—"I said 'Tommy have it!'" and goes on repeating this, chuckling and enjoying the joke—how can one deny him a reciprocal point of view and ability to distinguish between the external and the internal? And such instances can be multiplied from all the children one knows.

Has this feeling of surprise and uneasiness at the late ages assigned to the various stages any basis in statistical criticism? Very probably it has, for the 600 children between 4 and 12 years of age on which these views are based can hardly be regarded as statistically conclusive. The number of children of each age is not given, nor any independent and standardised measure of their intelligence. This may, of course, make all the difference to any argument about ages.

There are, however, factors in the astigmatism of Piaget's picture of the child which are probably more significant than the mere possibility of shifting the ages a year or two back. We would suggest two important considerations: (a) The failure to recognise the unevenness of the levels actually *functioning* in any one child, according to the moment and situation. (b) The fact that the method itself probably taps levels below those of the ordinary working instruments of the conscious life.

(a) When we are dealing with a standardised method of tests, we hold our conclusions valid only in the standardised conditions under which the test is made. The whole situation is clear and controlled, and we know the field which our conclusions cover. "Under these conditions, the average child will, with such and such a degree of probability, do such and such." Now in his interpretations and conclusions from his clinical method, Piaget is, of course, aiming at something far more universal and characteristic in the psychology of the child. He sets out to show the way the mind of the child works, not just under these specified and measurable

and standardised conditions, but under all and ordinary conditions. He is concerned not with a measurable piece of concrete behaviour, but with a general psychological law of development and pervasive modes of thought. It is true that he is careful to say that these underlying assumptions are *first revealed* by the method, and that they are not explicit in the child until the psychologist makes them so. But he nevertheless means that they are present and *active* all the time, over all the fields of the child's activity. He does not think that they come into *function* simply in the test situation. They are to be taken as representative of what lies at the basis of the child's ordinary ways of handling experience in his ordinary situations, and of the normal modes of his thought.

Although Piaget has many cautious and qualifying moments when stating his problem and the niceties of his method, yet when he comes to sum up his conclusions he is carried away, by the sweep of old philosophical allegiances, to rigid abstraction and wholesale hypostases, which ignore concrete psychology and the actual movement of children's minds. "There are thus two forms of egocentricity, the first logical and the second ontological. Just as the child makes his own truth, so he makes his own reality; he feels the resistance of matter no more than he feels the difficulty of giving proofs. . . . Ontological egocentricity is a principle essential to the comprehension of the child's world. . . . Precausality and finalism are, in fact, directly derived from this egocentricity." All this may be true of a philosophical lay-figure at the given ages; we do not recognise the living child, moving and doing and thinking in the concrete everyday world.

Yet we have to listen to the words of the children themselves when they reply to Piaget's questions; we have to note that under his conditions they convict themselves of these concrete beliefs. What then is the full truth?

In the first place, it is that children of all ages, like civilised adults and like savages (as the modern field-anthropologists show), function mentally on many different levels according to the moment and the situation, at one time logical and objective, understanding causality practically and verbally, at another egocentric and syncretistic, pre-causal and magical. When actually handling the physical world in a concrete field in which experience can count, all three of us, child and savage and civilised man, can be full of common sense and a matter-of-fact causality, according to the measure of our organised experience. When face to face with unknown issues, or when taken off our intellectual guard by strong desire or passion, by religious tradition or social prejudice, even the most civilised adults are liable to fall into every one of the errors of subjectivity—as, for example, the history of medicine or present-day political and economic controversies clearly show. The frequency and the kind of occasion on which we do so is in very large part a function of our concrete knowledge and the organisation of our experience. The *succession* of stages in the passage from full subjectivity, where this

is dominant, to causality and logic, in so far as they come to prevail, may well be those which Piaget has analysed so penetratingly and supported by so many clear instances; but the hard and fast picture of *the child*, of his magic and his realism, which is offered in the end, is psychologically inadequate and misleading.

This tendency to solidify the stages and hypostatise mental modes may arise in part from the method itself. But in large part it springs from presuppositions brought to the problem from philosophy and biology. When Piaget says in a typical passage (p. 32): "But by then (*i.e.*, 11-12) the child is no longer a child and his mental structure is becoming that of the adult," one has the sense that development is for him far less a continuous and cumulative penetration of mental functioning by experience than a succession of pseudo-biological metamorphoses, definite in mode and age of occurrence. It is true that he emphasises the effect of social life—the clash of opinion, the discovery of other points of view, and the need to justify one's own. But social experience seems to become effective (at the age of 7-8) only as the result of some inner ripening. And the whole of the child's direct and cumulative interaction with the physical world is overlooked in favour of the inner history of 'structural' development. When Piaget talks of the 'structure' of the child's mind, we seem to get a curious hybrid between the concepts of biology and of Kantian epistemology, 'structure' being something between a category and a digestive system. (This mixed affinity is actually made clear in the later book, *La Causalité Physique Chez L'Enfant*.)

We get the impression that Piaget conceives the child of certain ages as actually *resistant* to knowledge and to logic that he might have if he would—if he chose to stretch out his hand for it! But how *can* the child know the true relation of the movements of the sun and the earth and his own body until he has been taught them? And how *can* he know the right answer to "where do dreams come from?" or "how did the moon begin?" before he has been actually initiated into our particular intellectual conventions about the intention of such questions? One cannot give the right answer to the wrong question. Think of the actual amount, not merely of knowledge, but also of conventional mental habit, that goes to what we consider to be the correct answer to these queries! Deprived of that knowledge, of our general organised experience, and of our familiarity with scientific conventions, should we adults fare any better? The untrained, undisciplined and ignorant mind is, of course, egocentric, precausal and magical, in proportion to its ignorance and lack of discipline. But after infancy it is not accurate to represent it as ignorant merely *because* of its egocentricity—it is egocentric in large part because of its ignorance and lack of organised experience. No doubt there are limiting internal conditions and ages; but no less obviously, limiting experiences and lack of experiences. And it is essential to make the fullest allowance for these.

(b) In the second place, it is borne in upon us, after reminding ourselves of these varied levels of mental functioning in child and adult alike, that the clinical method actually brings to light not the ordinary intellectual tools of children at the ordinary level of practical life—but their deeper fantasies. Piaget is digging deeper than he realises. The child's mind moves in these ways of magic and 'participation,' of syncretism and precausality, in its deeper layers—as do our own, in dream, in reverie and free association. On these levels we also "fail to distinguish between the self and the world". They are, however, less easy to tap in us, and cannot be reached save by the special techniques which set aside our intellectual conventions and the play of knowledge. In us the ego and its memory traces are more secure and more firmly organised, and we are more deeply entrenched within the objective world. The child has not yet the organised body of knowledge to be able to resist being pushed back into the realm of fantasy and egocentricity, below relational thought. He has not yet built the common sense scientific world into himself deeply enough to rest upon it when apparently prompted towards his fantasies by an influential adult.

We are thus led to criticise—or qualify—the clinical method itself. There seem to be three grounds for dissatisfaction.

(1) A large number of the questions put to the children—for example, all those about meteorology, the movements of the sun and moon, and their origins—are concerned with matters of actual knowledge, the presence or degree of which will depend more on circumstance than, for instance, the minimal knowledge made use of in tests of intelligence. Countless unknown and uncontrolled factors will therefore blur any hint of internal development that might be hidden in them. In the later ages, for example, most of the children will have been deliberately *taught* the correct view. If he has not the knowledge, the child will answer out of himself—but of course he will then be egocentric!

(2) The suggestive power of the actual questions cannot be overlooked, despite all Piaget's cautionary technique. (a) The mere fact that some children have at some time asked just those questions, and that they are not mere adult importations, does not rob them of adult prestige when they are asked of another child, and asked of the child instead of *by* him. The adult does not lose his suggestive weight as adult when he talks the language of the child. Just as adult convention and the language of experience will inhibit fantasy in the child when they surround him, so when the adult prompts him to the release of fantasy, and he is pressed to follow it up, his more lately gathered and insecurely organised knowledge may slip away in bewilderment. This is, of course, well recognised with regard to intelligence tests. Burt cautions the experimenter with, for example, the definitions test, "Beware of saying, 'What does a horse do?'". Yet Piaget asks, "How did the sun begin?" "Where did it come from?" (b) The form of the question tends strongly to set the child's mind moving in a certain direction, and



limits his intellectual scope. For example, "Where do dreams come from?" and those already quoted. On the other hand, many of the 'why' questions, (Piaget's, that is),—Is the fly alive? *Yes*. Why? (*Pourquoi?*)—must be so easily confusing to the child that one cannot set much theoretical store upon deviations from sense in the replies.

(3) The clinical method, no matter how skilful the user, provides only a limited and stereotyped situation, the character of which necessarily puts the child at an intellectual disadvantage. He is sure to show himself at lower levels than in the more varied and co-operative situations of active daily life in school or home. With children as with animals, the psychologist has to offer real problems, those that are significant and attractive to the children or animals themselves. And he has to find ways of measuring and including the typical *best* performance of his subjects if he is to make any pronouncement as to the limits of ability, or to aim at a representative picture of any given age.

SUSAN ISAACS.

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*The Science of Character*. By LUDWIG KLAGES. Translated by W. H. JOHNSTON. London: George Allen & Unwin Ltd., 1929. Pp. 308. 10s. 6d. net.

PROF. KLAGES is difficult to place. He is a mixture of scientist and philosopher, and he is a philosopher according to the common acceptance of the term, that is to say, he is involved in his subject, he has strong feelings about it, he "minds" about it; he does not stand aloof like a pure scientist and describe and hypothesize; he does not take up a neutral position and discuss possible theories; he has some kind of message, and one which has "aroused such enthusiastic echoes in the souls of the young that we should hesitate to omit" an extract from a previous work "although it does not fully agree with our present view". This means that we must expect two things, firstly that he will have a peculiar personal view point to which we must ourselves approximate if we are to see what he sees, and secondly that he will express himself in a language peculiar to himself because, to speak for a moment in that language, his philosophy is coloured throughout with private vitality and is not exclusively an excursus of the spirit which is common to all. The difficulty is, of course, that the language through which we have to reach his angle may be so personal as to be unintelligible or, at least, excessively obscure.

The number of ways of looking at human life would appear to be limited, for, although a personal twist is always given to the concepts of Religious and Philosophical thinkers of past ages, modern philosophers of this type are constantly using antique phraseology. One of the most interesting features of such philosophising is that it throws into relief similarities of attitude through the ages of Greece and Christianity which often pass unnoticed.

We are frequently being brought up against a familiar phrase which we have despised as unintelligible when we found it as a bare aphorism, but which now in a new surrounding becomes illuminating and we say—"So *that's* what he meant".

Prof. Klages uses familiar phraseology; he bases his Metaphysic of Personality on the distinction between spirit, soul and body, and under the domination of personal feelings and the influence of such philosophers as Nietzsche and Schopenhauer he draws a distinction between negative and affirmative directions, while the whole is modernised and bound together by the introduction of Driving Forces and Urges, and the pretence of a quasi-biological approach.

The book is ill-organised and falls into two distinct parts which should be transposed. We are supposed to be dealing with character, and we are warned that we must not be alarmed at the phraseology employed. There is the usual attack on the "School" psychologists for wasting their time, and ours, according to Klages, on uninteresting questions of sense-perception which throw no light on the personalities of our village clergyman or our best friend. But for the fact that rage is one of the great motive forces for doing work we should deplore this continual sparring among people who are occupied on different districts of the same enormous realm. It is perfectly true that when we discuss a problem of perception we start from presuppositions which are totally different from those assumed when we discuss the plausibility of the *Œdipus* complex with a psychoanalyst. In practice the transition occurs automatically, and sometimes we are interested in the one and sometimes in the other. Writers alone seem to find a difficulty in understanding why everyone is not exclusively interested in their particular branch of the subject.

The Second and Third Chapters deal with the methods which lie at the back of the "understanding" of character, and with the Fourth Chapter we pass on to the subject of concepts which we must use as bricks for building a theory or science of character. This leads to a distinction between talent or capacity, structure and nature. Klages' view is that vitality, in the form of directive urges, driving force, and interests, is given a machine with a certain constitution to play on. The organism through which vitality expresses itself has certain talents which may or may not be made use of, and a certain structure or set of balances between opposing poles of ease and difficulty—one might say, a certain degree of greased-ness or oiled-ness in various of its parts—and behind the whole scheme are the fundamental vital urges of sex, hunger, thirst, etc. The constitution and structure are constant while the interests vary from time to time.

The treatment of structure of character is interesting. It is expressed as a set of ratios of opposing features. There is, for instance, a depth of feeling and a liveliness of feeling, and the capacity of one individual for the stimulation of feeling (p. 143) "grows with the growing liveliness of feelings and diminishes as their depth

grows" and is expressed in the form of a fraction, while it is further pointed out that the same capacity may be due to a deficiency of one and an average amount of the other, or an average amount of one and an abnormally large amount of the other. This method is employed in three categories of structure; feeling, capacity for stimulation of the will, and personal capacity for expression. And descriptive words, such as 'thick-skinned,' 'schemer,' 'faddist,' 'impulsive,' 'suspicious,' 'extravagant,' 'high spirits,' are interpreted in the light of such proportions.

It will be seen that Klages approaches the personality here from a point which is almost opposite to that of the psycho-analyst. He takes human beings as we know them and not as they are interpreted for us, and he analyses their surfaces. He takes such notions of everyday life as 'ambition,' 'love of children,' 'contradictoriness,' 'probity,' 'sense of duty,' etc., seriously and not as the unimportant masks of more important forces. He says that where you have a notion in current use, which everyone understands, there must be something behind it, and a branch of psychology must deal with the organisation of that which has given rise to such notions; the psycho-analyst, on the other hand, in spite of his play with etymology, practically says that by the very nature of the case the speech of everyday life can throw but little light on what is really there, so that instead of ordinary expressions we are taught to become familiar with language which, to those who are ignorant of the subject, sounds indecent and ridiculous. It would be easy to explain Klages' view of the structure, nature and material of character to anyone who is interested in 'people,' but the moment one thinks psycho-analytically one is in a different world, though both views throw light on the same subject.

It is important that these two approaches should co-exist because, as Broad has pointed out, there is a danger that people will think that when they have interpreted a familiar characteristic as a symptom of a recondite driving force, they have in some way altered the quality of the characteristic and "explained it away"—it still is there and has to be dealt with in its own right; people are no less prone to suffer from the specific feeling of irritation with those in authority over them because that irritation is due to an ambivalent attitude to their fathers.

So much for the scientific portion of the book; it is helpful and suggestive.

But now we pass through a difficult Chapter on Hysteria to the Metaphysics of the Distinctions of Personality and we reach a philosophic outlook which is of enormous importance to the author. The earlier distinctions and analyses do not stand or fall with the philosophic part of the work but it would have been more convenient if the philosophic part had been placed first. "A personal ego," that is "a vital entity plus spirit," we read on page 93, and we do not take the word "spirit" very seriously. Had we read Chapters IX. and X. first we should have understood better what

he meant. The position in general is familiar and easy to grasp. Any organisation is, to speak tautologically, opposed to a degree of dis-organisation incompatible with it. The organised reaction of a dog scratching his shoulder with his hind leg is incompatible with the random excitation of all the limb muscles of the animal; inhibitions automatically preserve the integrity of the pattern-reaction which is being elicited, together with the postural integrity of the animal as a whole. The larger and more complicated pattern of personality involves an enormous complexity of inhibition and restriction to preserve its integrity, and any impulse which presents itself for performance is fought, disguised, or immediately incorporated, according to its fittingness with the ego-pattern. Similarly in the realm of ideation, there is a restriction of randomness into orderliness which makes "free" association different from thought which is obedient to logical rules. Furthermore we can distinguish between personality-patterns which are catholic in their tastes, and in which there is comparatively little restriction, from those which are relatively tight and narrow. In the former one will find comparatively few struggles of will against temptation, in the latter one will find a great many, and the latter type of person will be shocked at the lack of order in the life of the former type of person. In company with Freud, Groddeck and Klages one may call the seat of impulses the 'it' (or the Id) and the narrow, shaping, organising and therefore restrictive channel the 'ego'. Now it seems to be the case that among humans there is intense restriction and struggle in the ego. Freud has said that the great difference between human beings and animals is that the former alone are subject to neuroses. Whether there are complicated repressions and disguisements in the animal kingdom we cannot say, but it looks as though there were a convenient fittingness between desire and desire, and desire and satisfaction, as if animals were in tune with their universe. But human beings obviously are not. Is this due to an increased complication of desire, or increased difficulty of satisfaction?

Round some such alternatives must lie the answer; it is not very helpful to say, as Klages does, that where spirit or the ego makes its appearance, it inevitably lies outside the general stream of life: that is merely a way of describing some of the phenomena attendant on the development of reason and self-consciousness as tools to take the place of teeth and claws.

Whatever the cause, we find on this level of the animal kingdom a controlling force which we do not believe to exist elsewhere, and which compels the vital forces of the organism to take a certain shape: which is like an energised mould restricting, forbidding, organising, and which has integrity principles of its own which may be in conflict with the integrity principles of the total organism. It is surprising that Klages pays so very little attention to one of the possible determining factors—society. It is true that he does say that "The field in which all egoisms alike develop is society," but

this idea is not carried any further. The growth and violent integrity of this ego principle may, surely, be due to the operation of a change which, according to Heard, must have occurred in human evolution when the human being emerged from the primitive and hypothetically un-individualised conditions. Klages just takes things as he finds them; suddenly this ego appears and with it consciousness, thought, reason, and, above all, will.

It is hard to express this view of the human constitution without using lively language; one sees the force of the 'it' and the integrating and integrity-preserving force of the ego in relation to one another, but insensibly the relation becomes coloured; we are in the midst of it all and we speak of a battle ground—of conflict: the ego-forces are *hostile* to the it-forces, force is *imposed on* resisting matter. We are excited by the idea of the fray, we poetise, we philosophise, and while we may thereby gain and convey a clearer view of what we are trying to see, we are apt to permit ourselves expressions which are the very reverse of useful. We are involved in our subject and we are apt even to take sides. In this realm, the most important introduction to Klages' own view is page 184 where we have a glimpse of his predilection. Man has changed, he says. "The mankind of heathen temples and festivals, of Gothic cathedrals and glowing twilights, of pomp of robes and sounding organs is finished, and has given way to a generation which manifests itself in Stock Exchange, Wireless, Aeroplane, Telephone, Cinematograph, factories, poison gases, instruments of precision, and newspapers. The pilgrim's path has its stations, which end at Golgotha, and similarly the path of Spirit in European man has its main chapters, which may be headed as follows: war of body and soul—decorporisation of the soul, or condemnation of joy, or paralysis of creative force—extinction of the soul in body, or blinding of intuition, or, the body as machine—man as the instrument of the will to power—in place of the soul, soul-mimicry, the phantom, or Mask." He prefers soul—the vitality—to spirit. The whole light is concentrated on a theatrical stage on which is played the fight between soul, or vital force, and the armies of destruction—the will or spirit. The advantage of the whole picture is that it throws up the conflict in high relief and leads to a valuable analysis of the 'Bonds' of the ego, and the ways in which egoism shows itself. But the theatrical representation leads us into exaggeration and falsities of detail, and inconvenient confusion. A great service, however, is rendered by the insistence on the power which the ego wields in its own right and for its own purposes once it makes an appearance, just as a human institution will generate self-preservative forces which may even run counter to the purposes for which it was originally formed.

He regards the will as negative, vital urges as affirmative; he pits bonds against releases, and, curiously enough, considering his note on psycho-analysis, love against the repressive forces of the ego. "It is true," he says (p. 289), with the pardonable exaggeration of

anger, "that the mis-shapen creature (psycho-analysis) also bears traces of certain influences of a comparatively exotic nature, for example, in the shape of the doctrine that the whole of man, and, indeed, the whole world is sex". We turn to p. 265. "After our somewhat exhaustive consideration of the Bonds," that is the restrictive principles of the ego, "the chief Releases result automatically. If we comprehend them all under the one name of love, then we must distinguish spiritual love (which always requires the mediation of one of the abstract terms—truth, beauty, justice), and love of the person, which always requires the mediation of concrete facts: the former is called enthusiasm, the latter love in the narrower sense or depth of feeling, or, finally, passion". Readers of Freud will at once call to mind similar passages.

The main confusion which runs through the whole of the latter portion of the book concerns the nature of will, not the ultimate nature, which is obscure enough, but the thing one is talking about. In the first place there is the situation in which an unpalatable impulse makes its appearance, demands expression, and is interrogated at the frontier. A discussion ensues, and in the usual classical account of such experiences it is pointed out that in some sense or other the whole self is involved on one side of the conflict, and a man of "strong will" is a man whose frontier forces keep a great number of applying immigrants from setting foot on the ego's territory. There seem to be two features involved, firstly that a large number of impulses are checked, and secondly that, while the impulses are strong enough to cause an appreciable battle, the repressive forces are even stronger. In this sense no one can earn the title of "having a strong will" unless he has a "wicked" enough nature. This will it is that "never possessed me, but it is I who generate it" (199) and, with respect to the repressed tendencies, it is "negative". Now this is peculiar to human beings, according to Klages, because human beings alone have egos. But will can serve "such goals as are set by love"; how? "It has the sole function of removing obstacles which stand in the way of realisation". Here we come across a completely different notion of will, which is obviously common to all animals. There is an example given; a lover jumps into the river and has to battle with the currents in order to rescue his drowning sweetheart. The point is made that if he gave himself up to loving he would be lost, he must (p. 215) "struggle with the current, struggle with the weight which draws him down, struggle with the movements (which perhaps hinder his purpose) of the drowning girl: and the impulse-foundation of this is will to assertion, will to overcome, and will to power". Surely it cannot be denied that here we have a driving force which possesses the man, and which he does not generate in the same way in which he generates the repressive will mentioned above; and equally certainly is he also possessed by the feeling, or driving force (the two are practically identified by Klages) of love. It is false to say that it is only the will to power which dominates the

scene, and it is absurd to say, as he says a few pages before, that love is essentially passive and hate essentially active.

If you place a piece of meat on one side of a wire fence and a hungry dog on the other, the dog will act in a hostile and destructive manner towards the obstacle, but we should not say that the dog's will was strong, or, if we did say so, we should mean something different from what we should mean if we complimented the dog on having a strong will because, though it wanted the meat badly, it left it to a friendly cat more in need of it than himself. The common factor is effort or output of energy, but if we are going to make anything of the distinction between the ego in conflict with the it, we must obviously discriminate between that output of energy which is essentially connected with the integrity of the ego as distinct from the organism as a whole and that which is not. In both cases damage is done, no doubt, but it is hopelessly confusing to make the doing of damage the fundamental feature of 'the will'; and in Klages' case the result of so doing is the following doctrine (p. 209). "We shall forthwith reveal the reason why the will is not so much the instrument as the medium of a power which must deny life itself in denying the soul of life: the reason lies in this fact that its character is to be a happening which is in conflict with being; to be a destruction which without beginning or end ever renews itself." And: "Volition essentially is a fight with corruption, victorious in places, but finally hopeless and vain; and hence, in accordance with the curse of Jahve, it is labour, trouble, and care, with the final prospect that the willing entity must become dust, and that sooner or later his work must become dust."

Leaving aside the grand philosophical Anschauung which lies behind these oracular dicta we can distinguish two theories worthy of contemplation. Firstly that acts of will in the first sense are peculiar to human beings in virtue of the ego construction, and secondly that no efforts of will of the second kind can take place without "the participation of the impulse of self-assertion". If by self-assertion is meant something to do with the ego constitution, this is obviously false on Klages' view; if it means that whatever urge is operating, sex, hunger, etc., then all those forces which operate in the direction of the preservation and advancement of the whole organism in its environment are also called into play, then it is possibly true.

Finally it may be remarked that, as Klages rightly points out, we cannot but try to interpret his book in the light of our own personal experience, and many of us find that the crushing, repressive, destructive operation of will which he describes is unfamiliar in actual fact; we find that reason and control are helps rather than hindrances to the "enjoyment" of life, and that so far from the dull, mechanical, formalities which he foreshadows, we can face the possibility of an increased variety and intensity of experience. But, of course, he has provided for that by saying that we are endowed

with these "affirmative" and "negative" factors in proportions which vary from person to person, though why there should be no optimal proportion is left unexplained. As usual the emotional passages of the work throw a light rather on the character of its author than on the nature of the human universe, and leave us on the brink of the epistemological precipice. How far can we discount personal peculiarities when we leave biological constataion and hypothesis for the livelier realms of preference and disapproval?

W. J. H. SPROTT.



## VII.—NEW BOOKS.

*The Guidance of Conduct.* By EDWARD T. DIXON. Psyche Monographs : No. 2. London : Kegan Paul, Trench, Trubner & Co., Ltd., 1928. Pp. 216. 10s. 6d. net.

THE reader must not be misled by the title of this book and take it for yet another general work on Ethics. Though the majority of the essays contained in it deal with ethical, social and economic topics the underlying interest is logical. Major Dixon intends his treatment of these subjects to form an introduction to his "Symbolic Theory of Order," for the application of which they afford material; and if we may judge from this 'feeler,' it will be worth the while of the philosophic public, by according it the attention it deserves, to encourage the publication of the parent book in which that theory is worked out. It is this dependence on the Theory of Order which accounts for the apparent disconnectedness of the topics dealt with—*e.g.*, "On the interpretation of formulas," "An experiment with time," "A calculus of motives," "The division of labour"—but without going outside the present work it is possible to find a strong thread of connexion, woven of three strands—subjectivism, pragmatism and insistence on a fundamental distinction between real and symbolic propositions.

According to Major Dixon we know directly and 'primarily' only our own mental states, and our practical activity is directed only to controlling the course of our own mental life (pp. 24-25). The thought of a not-self and belief in it arises only when we try to explain the limitations of our power over our own inner experiences. We find ourselves 'interfered with,' and in order to get the experiences we want we have to find a way of dealing with the interfering conditions. This involves at least forming some conception of what they are in order to control them or adapt ourselves to them; but the concepts, thoughts or ideas by means of which we do this are for Major Dixon just as subjective as the inner experiences we are trying to control. Conceptions, feelings, mental states and thoughts are classed together (p. 37). We cannot, therefore, *know* the interfering conditions (*i.e.*, any part of the whole of reality other than our own mental states), nor do we need to. "What really matters is what things DO; first of all what they DO to ME, or, conversely, what I can DO to THEM" (p. 21). Propositions, then, are nothing whatever more than formulas for the guidance of conduct, progressively modified and corrected by a continual process of trial and error. To regard them as containing fixed and final truth is to commit the mistake repeatedly condemned by Major Dixon as "making to ourselves pictures". Like Protagoras in the *Theaetetus* he combines with his Pragmatism a complete Subjectivism, thereby showing himself a logical Pragmatist. His special brand of Pragmatism is further marked by his distinction between real and merely symbolic or verbal propositions. Both of course are formulas for the guidance of conduct, but in different ways. A real proposition (*e.g.*, 'this hill is steep') directly determines conduct; a symbolic proposition (*e.g.*, 'a straight line is

the shortest distance between two points') only prepares the way for the discovery of a real one, by supplying guidance in the use of words or other symbols. It has practical value only if the symbols have real application—and this can only be discovered by trial and error. The whole of pure mathematics and symbolic logic consists of such pragmatic experiments. Definitions are the fundamental type of symbolic formulas, all others being 'formally' derivative; and the peculiarity of definitions is to be 'arbitrary'. This arbitrariness at first appears to consist in 'laying down' at will either the connotation or the denotation of a term and attending exclusively to it and to what is formally implied by it (p. 11). Given the connotation the denotation is fixed and not arbitrary; and inversely. A proposition which connects a certain connotation with a certain denotation has therefore 'real import'. But later (pp. 32-33) the special arbitrariness of symbolic propositions appears to lie simply in the fact that in them a symbol is freely chosen to stand for a whole complex formula. If definition is taken to consist simply in attaching a certain symbol to a certain meaning, then it is true that, provided the symbols are used consistently, the process of defining is arbitrary in the above sense. But this view seems hardly to account for the importance which Major Dixon evidently attaches to the distinction between real and verbal propositions. For a proposition which marks off a certain symbol to stand for a certain meaning must have 'real import' in the same sense as any other proposition. I must be referring to what I mean in order to choose a symbol for it; and the process of determining what I mean cannot be arbitrary, though Major Dixon seems to take for granted that it is so. My subjective interest no doubt plays a part in determining me to attend to this rather than that, but the nature revealed by the object when I attend to it, and its distinction from and relation to other objects do not depend on me and cannot properly be called arbitrary. A symbol may of course be chosen arbitrarily to represent other symbols, but this is obviously only pushing the question further back. In the end a symbol must stand for something not itself a symbol, to which I refer in the act of assigning its meaning, and which by analysis and comparison I intend to mark off from other objects of thought.

In his pragmatic treatment of social and economic problems Major Dixon frequently displays a shrewdness which gives a new turn to old questions. His style is refreshingly direct and unacademic, but not as a rule at the expense of precision. Sometimes, however, it is not easy to make out just what he is driving at, and sometimes he appears only to be saying in a perversely "original" terminology things which could be and have been equally well expressed in more familiar terms. We may refer briefly to his treatment of two topics—organisations and property—as representative of his method. In the two chapters on organisation (IV. and V.) he urges that there are three binding principles present in various degrees in all or nearly all organisations—the fear of punishment, the hope of reward and the 'sympathetic communication of values.' The last, in which Major Dixon is specially interested, consists in conveying to a subordinate a desire to do a certain work, not a desire depending on fear of the consequences of not doing it or expectation of an external reward to be won by doing it, but a desire to do it for its own sake—i.e., because its performance has value for him. The value thus communicated is the same for both minds, and, being shared, unifies the minds which share it (p. 116). Major Dixon does not make it clear whether he means that the commonness of the value consists merely in its being recognised by each as the same for both, and possibly as attainable only by the joint efforts of both, or that they share a common value (or interest) in the sense that A makes B's interest a part of his own, and *vice versa*. I suspect that he means 'common value' in the first sense; yet it is only in the second

that it can truly be said to unify the minds which share it. Nor does he give any account of the formation of societies—*e.g.*, as depending on pre-existing interests which demand organisation for their adequate satisfaction. Rather, he assumes that an organisation is already formed, and advances the theory of a communication of values to account for its cohesion, regarding the communication as one-way rather than reciprocal—*i.e.*, the values which are to count in the organisation emanate solely from its head. He does not speak of a common interest continually being modified by interchange of opinion (itself the result of trial and error) among the members. This is probably because he has military organisations mainly in view; and, in spite of his denial on p. 127 that military organisation is founded mainly on the fear of punishment, I suspect that this prepossession is responsible also for his belief that "the crude method of punishment lies at the basis of nearly all organisations" (p. 109; *cf.* p. 132).

We cannot omit a brief reference to Major Dixon's novel and suggestive theory of money and property (Chapter VI.). Money is merely a token standing for the real 'power to make men do things,' and possession of something means simply power to make men do or refrain from doing certain actions relative to that thing. The power is never strictly *power over the thing*, but power over other people (143 ff.). Such power is transferable from mind to mind or from society to society, and it is in this sense only that property is transferable. But it is only when it is exchanged (as distinct from transferred) that it acquires a price or money value (it is not merely that an indeterminate money value becomes determined by exchange—the possession is not 'amenable to that calculus' before exchange). Major Dixon suggests that only what can be transferred is properly speaking property. From this follows the interesting conclusion that knowledge—even knowledge of secrets—is not property in the ordinary sense. For knowledge is not transferable; it is possible for one mind to start another on a train of thought similar to its own, but the thoughts do not leave the first mind to enter the second.

Criticism of a book like this cannot be confined to generalities, and the impression left by the discussion of selected details may easily fail to do justice to the interest of the book as a whole. I must add, therefore, that I found it stimulating and suggestive—which is all that its author's philosophy would allow a book or a teacher to be. It is plainly a strenuous effort of original thinking, which ought not to be lightly dismissed.

A. K. STOUT.

*Hegel: sein Wollen und sein Werk. Eine chronologische Entwicklungsgeschichte der Gedanken und der Sprache Hegels.* VON DR. THEODOR L. HAERING, O. Professor der Philosophie an der Universität Tübingen. I. Band, mit einem Faksimile. Leipzig und Berlin: Verlag und Druck von B. G. Teubner, 1929. Pp. xxiv, 785.

This is the first instalment of what promises to be a very large and comprehensive work, dealing with the whole life and philosophy of Hegel. It is described as being concerned with his Aim and his Work. I suppose this first volume, which treats of the first thirty years of his life, may be said to be largely concerned with his Aim, while the complete account of his Work will be contained in the succeeding volume or volumes. If the later writings are dealt with on a scale at all comparable to that with which the earlier writings have been discussed, they will almost form a Library in themselves; but probably the fact that the earlier writings are

less well known has led Professor Haering to give special attention to them. Haering himself is already well known as the author of many large books. Most of them are concerned with theological aspects of philosophy; but his latest and probably best known work is on *Die Struktur der Weltgeschichte*. It is a somewhat searching criticism of the famous book by Oswald Spengler. The immediate occasion for the publication of the present volume has been supplied by the comparatively recent collection of 'Hegels theologische Jugendschriften' by Dr. Herman Nohl. These early essays have, I believe, hardly been referred to hitherto by English writers on Hegel except in the excellent summary that is given in Edward Caird's little book. They are not difficult to read. Hegel paid rather more attention to literary form in his earlier writings than he did in those works by which he is chiefly known to English readers. He even wrote some poetry, though hardly of a kind to challenge comparison with Goethe's. This, in conjunction with what we learn of his general habits of life and of the regard in which he was held by others, ought, I think, somewhat to modify the view of him which even so devoted a disciple as the late Lord Haldane endorsed,<sup>1</sup> as being 'a hard, dry man'. 'Dry' perhaps he was, patient, laborious, highly technical and sometimes a little tedious, as most Swabians are; but friendly and 'gemütlich,' like his countrymen in general. It was in his later years that he was supposed to be 'hard,' on account of his association with the Prussian government—an association that was, I think, to a large extent misunderstood. At any rate, it is pretty certain that no one would have thought of him as hard during the early years with which Haering is here concerned. His relations with his contemporaries—notably with his younger contemporary Schelling—appear to have been of a very cordial character.

These early writings are described by Nohl as 'theological'; and, in a wide sense, it is true that Hegel's early interests—and indeed his later ones also—might be described by this term. There is a well-known legend that, when he completed his course as a student at Tübingen, he was certified as having given much attention to Theology, but none to Philosophy. Haering has at last destroyed that legend. It seems that it arose from a misprint of *nullam* for *multam* in one of the early references to his certificate. In any case, I suppose Hegel would never have recognised that Theology could properly be treated otherwise than as a part of Philosophy. The earliest of his Essays, however, are concerned rather with Religion than with Theology in the stricter sense. They deal, in fact, with what is now generally known as Social Philosophy. Religion is regarded by him as a necessary and fundamental aspect of the social unity. The writers who are chiefly referred to, in this connexion, are Rousseau, Montesquieu, Shaftesbury, Gibbon and others of the same general type—writers who would not generally be classed as theological. In the later Essays, however, Hegel was more and more led into discussions that might properly be characterised as theological. It would not be possible to discuss these discussions with any profit in such a review as this. It is well known that there has been much difference of opinion between Hegelians of the Right and Hegelians of the Left as to the conclusion to which Hegel's studies led him. I understand Haering to be a supporter of the Right; and, if he errs, it is certainly not from lack of thoroughness in setting forth the evidence.

In the later chapters of the present volume some account is given of the beginnings of Hegel's treatment of the Philosophy of Nature and of the problems of Logic. Haering emphasises, in particular, the interest that Hegel took in the work of Newton and his followers. He shows, I think,

<sup>1</sup> In the Preface to the recent translation of Hegel's greater *Logic*.

convincingly, that this was greater than has been commonly supposed. Of course, Hegel wrote, not merely long before the modern views of the spatio-temporal system, but also long before there were any definite theories either of biological evolution or of evolution in the more cosmic sense; and it can hardly be doubted that he would have given a very hearty welcome to the advances that have been made in these directions. But I think Haering succeeds in shewing that Hegel had a greater appreciation of the scientific work that had been accomplished in his own time than has been commonly recognised. There has perhaps been too great a tendency to represent Hegel as having written as if he was convinced that there were no worlds of any consequence but our own planet, and as if its history had come to an end in the early years of the nineteenth century. Probably most of us are rather prone to think of ourselves as the heirs of all the ages and as not likely to be succeeded by anything much better or more interesting; and the builder of a great system, like Hegel, may be specially prone to such an illusion. But it may be doubted whether he was really as much misled by it as has sometimes been supposed. He wrote about reality as he knew it, and did not pretend to be a prophet.

It cannot, at any rate, be doubted that this volume is a most valuable contribution to the interpretation of Hegel. It is greatly to be hoped that its author will succeed in completing his work, and that it will in time be satisfactorily translated into English. It is abundantly apparent, from the present volume, that he is exceptionally well qualified to deal with Hegel's philosophy in all its aspects—with his completed Work, as well as with his early Aim.

J. S. MACKENZIE.

*Metaphysik als Wissenschaft vom Letzten.* By Dr. HUGO DINGLER. Ernst Reinhardt, Munich, 1929. Pp. 291. M. 11.50.

This book is a very good piece of work, though it is hardly possible to agree with the extravagant claim implied that it provides the final and certain solution to the agelong problem of the ultimate basis of knowledge and philosophy. The author seems greatly to overrate the originality and the importance of his leading conception that all philosophy must have as its final basis and its one ultimate underived guarantee of certainty our immediate experience, as it really is, with object and self in unity and not yet conceptually distinguished. He has, indeed, dealt with this ultimate fact of immediate experience effectively and well, avoiding both the danger of reducing it to abstractions (such as e.g. the sense-data of the empiricist philosophers) which can only be the result of subsequent reflection and the opposite danger of merging all philosophy in an irrational intuitionism. But it is far too much to claim that the discovery of this immediate experience as our ultimate basis can in itself solve all the chief problems that have divided philosophers in the past. The author tells us that the antithesis between idealism and realism has now been overcome because in our immediate experience we do not regard physical objects as separate things from ourselves to be reached by inference, and because physical objects as existing when not perceived are an intellectual construction and therefore do not come in the same order of reality as immediate experience; he tells us that the problem of the relation between mind and body no longer exists because the conscious states of the self and the brain-states to which they relate cannot be experienced by the same being as referring to the same object and therefore need not be related or come into conflict at all. But, even granted

that the world of physical objects is not immediately given but a mental construction, surely this does not exempt us from the problem as to the nature and validity of this mental construction, and, since we cannot avoid putting mind and body in the same world, from the problem of the relation between them. The author thinks that I ought to work out my system of knowledge solipsistically, as if I had set it up for myself alone, and so seems to think himself exempted from many of the problems which like the above arise from bringing different experiences together, but he does not explain why, not being solipsists, we should act as such in our thinking. Nor does he succeed in explaining how, starting from the stage of immediate experience, we can yet build up the concepts which are still necessary if we are to have any philosophy and science. He is at great pains to emphasise that they are constructions of our mind, but he is not so clear as to the objective reality they at least claim to describe nor as to what gives them even partial truth and validity. Also his attempts to lay down the basis for ethics and religion seem to me still further from success. In his account of ethics he gives an admirable exposition of the doctrine that judgments of value are not derivable from judgments of fact, but I am quite unable to see how this can be reconciled with his own attempt to derive all ethics from the fact of will, the will for existence. Nor is it easy to see how religion could be satisfied with a view that forbids it to assign any qualities to the object of worship whatever. Surely it is absolutely essential that to what we worship we must assign at least value (supreme worth), yet his account of religion has no reference to value.

These criticisms and the contrast between promise and performance would, however, if taken by themselves, convey a too little favourable view of the book, which after all contains a very able and valuable exposition of a way of approach to philosophical problems that is capable of throwing light on many points, and does a good deal to elucidate, as far as it can be elucidated, the difficult conception of immediate experience. It suffers from an attempt to deal with too many problems, taking in the whole of philosophy at once, so that, despite the author's clear and good style, many cardinal points are left in great obscurity; but in its statement of the problems and its effective analysis it should be of real value to the student. It is a pity that no index is provided.

A. C. EWING.

*The Future of an Illusion.* By SIGMUND FREUD, M.D., LL.D. Translated by W. D. ROBSON-SCOTT. Hogarth Press, 52 Tavistock Square, London, W.C. 1. 1928. Pp. 98. 6s.

Dr. Freud is under no illusion as to the indispensability of religious ideas in the social life of mankind as it has until now been known to us. In this short brochure of 100 pages he is raising the question "what are these ideas in the light of psychology; whence do they derive the esteem in which they are held; and further, in all diffidence, what is their real worth?"

On the question what is meant by "religious" in this programme, one may again quote him. "Having rejected various formulas, I shall take my stand by this one: religion consists of certain dogmas, assertions about facts and conditions of external (or internal) reality, which tell one something that one has not oneself discovered and which claim that one should give them credence." His results cannot be better expressed than in terms of an excellent brief apologia in his concluding chapter. "Take my endeavour for what it is. A psychologist, who does not deceive himself about the difficulty of finding his bearings in this world, strives to review

the development of mankind in accord with what insight he has won from studying the mental processes of the individual during his development from childhood to manhood. *In this connexion the idea forces itself upon him that religion is comparable to a childhood neurosis, and he is optimistic enough to assume that mankind will overcome this neurotic phase, just as so many children grow out of their similar neuroses.*"

I have italicised the last sentence, because it marks the centre of gravity of the book; and therefore the issue upon which, in fairness, discussion ought to concentrate. Elsewhere in the volume the Author specifies the neurosis in which he finds the parallel, as obsessional. The conception, therefore, of the destiny of religion which he would put before us is that its "meaning" should come to be perceived, and that it should, therefore, lose its power, as other obsessions do when their "meaning" is perceived and acknowledged by the subject of them. Society may awaken to health after religion has gone, precisely as the patient awakens to health after the obsession is gone. The view is not without its fascination. Criticism of it, upon which there is not space to embark, need not proceed by at once denying all analogy. It would have to depend on an intimate knowledge of what happens in the pathological case, particularly of how that condition of health and normality to which the patient awakes, is related to the condition from which he is set free. *Prima facie* there seems to be as much evidence against as for Dr. Freud's case. He would be the first to agree that there are innumerable inhibitions and restraints which are not pathological, and that it is the restoration of these to their normal function, rather than the removal of all inhibitory activities, which is the object of psycho-therapeutics. That release of society, then, which sets it free, probably consists in the same way of a spiritualisation of religion rather than a removal of it. And if Dr. Freud insists that one cannot spiritualise religion without removing it, we must tax him with an unhelpful definition of religion.

J. W. S.

*Experience and Nature.* By JOHN DEWEY. New revised edition. London: G. Allen & Unwin, Ltd., 1929. Pp. xi + 295. 12s. 6d.

This second edition of *Experience and Nature* is welcome; firstly because Chapter I. of the old edition has been completely rewritten; secondly because the remaining chapters, which are unchanged, provoke thought.

In the new preface Prof. Dewey says that the old first chapter failed to be an introduction because "it was on the whole more technical and harder reading than the chapters it was supposed to introduce," and because it was "rather confused in mode of presentation, and at one important point in thought as well." The new first chapter is undoubtedly much clearer than the original. It is however difficult to discover precisely which change remedies the "one important point" of confused thought to which Prof. Dewey refers. This is because a number of points which were unclear in the original have either been omitted or are stated more clearly in the new chapter. Apart from the welcome change in the order in which the topics are discussed, perhaps the most important change in this chapter is the substitution of the contrast between the subject matter of crude experience and objects of reflection for the contrast between two ways of "approaching the goal of philosophy," namely, to begin with "experience in gross" or to begin with "refined selective products".

The statement of this contrast in the second edition enables Prof. Dewey to point out the advantages of an empirical method as distinct from a non-empirical method in philosophy. These are identical with the advantages



of an empirical method in science, and accordingly philosophical theories are to be tested by (1) verification, (2) the light they throw upon facts.

The preface which has been added in the second edition summarises the main lines of thought. The paging has been so arranged that after the first chapter there is exact correspondence with the first edition. This is convenient. Since only negligible changes have been made in the remaining chapters it is perhaps legitimate to devote the rest of my space to asking Prof. Dewey three of the many questions which have been provoked by these chapters. (1) Does he believe that such a book as for instance *The Nature of Existence* is (a) sterile dialectic, or (b) a working hypothesis because it might have useful consequences, or (c) neither? (2) Does he believe there is no relation of entailment (such for instance as many philosophers believe exists between being the specific colour of this page and being coloured) as distinct from a causal relation (i.e. a relation between terms with temporal properties)? Lastly (3) Exactly what new knowledge about the most general characteristics of nature does he believe he has discovered by his empirical method? Has not Prof. Whitehead already made us aware of its contingency and its uniformity?

E. M. WHETNALL.

*Essai sur la Logique de l'Invention dans les Sciences.* Par JACQUES PICARD. (Bibliothèque de Philosophie Contemporaine.) Paris: Félix Alcan, 1928. Pp. 289. Price 25 fr.

IN this study M. Picard is concerned with logical method from the point of view of discovery, as contrasted with what he regards as the current view of logic as the logic of proof. He has two main theses: first, that logical method does actually aid the investigator both to form and to test hypotheses; second, that underlying the process of formation of hypotheses there is always an appeal to analogy. Investigation can thus be described as a methodical search for fruitful analogies. The scientific imagination, whose possession in a high degree is the mark of genius, may reach heights inaccessible to the plodding understanding, but its achievements are not independent of method; and the analogies suggested by it are integrally bound up with processes of verification methodically pursued. M. Picard supports these theses by a detailed examination of logical method, quoting freely from the work of the great discoverers in science. He makes much use of Bacon, Mill and Bain, and has many penetrating comments on detailed points.

He agrees with Duhem (as against Meyerson) that the object of investigation is not explanation, but description; thus the principles of explanation which Meyerson regards as essential to the process of discovery are rejected by him. He admits that Meyerson has shown that many investigators have been led to discoveries by the desire for a causal explanation of events; he denies that Meyerson has shown or could show that the causal principle (as interpreted by him) was a logical guide to them in their work. As Duhem says, men have discovered new lands in the search for Eldorado, but we do not therefore put Eldorado on our maps; and M. Picard in this study confines himself to logical methods. This insistence on strict logic rather narrowly interpreted has the advantage of keeping his study clear and precise; but it has disadvantages. The logic of discovery which keeps what it regards as Eldorados off its maps is in danger of overstressing the part played by calculated steps in the actual processes of discovery. It is of course difficult for a "logic of discovery" to keep a proper mean between a "logic of proof" and a "psychology of discovery".



M. Picard keeps strictly to logic; and his discussions are at times indistinguishable from those conducted under the ægis of the "logic of proof," though his stress on discovery vitalises his treatment.

L. J. RUSSELL.

*Wilhelm Diltheys Theorie der Geisteswissenschaften. Analyse ihrer Grundbegriffe.*<sup>1</sup> By LUDWIG LANDGREBE. Halle: Max Niemeyer, 1928. Pp. 130. M. 9.—

Perhaps the subject of this book might be best described in English as the epistemology and the psychological basis of the non-physical sciences, especially history and literary studies. The position of such sciences and the problem of the objectivity of the knowledge they claim to provide is one of the principal questions that occupy German thought at the present moment, more so than it occupies British; and the author rightly emphasises the necessity of developing a philosophical conception of these branches of knowledge which, to interpret his words freely, will be scientific in the widest sense and yet not mechanistic or naturalistic. The book is primarily an exposition of Dilthey's thought on the subject, the author occupying relatively little space with criticisms of his own; and I am unfortunately handicapped by a lack of knowledge of that writer, though pressed to undertake the review in spite of this deficiency. I must say that it gave me a certain feeling of disappointment in that a good deal of it seemed to consist of mere commonplaces, well expressed in philosophical language, but after all "the kind of thing which everybody really knew already," though I am not prepared to apportion the responsibility for this between the thinker with whom the book deals and his expositor. Needless to say, this does not apply to the whole work, and Dilthey no doubt puts forward some conceptions of great value, e.g., in his view of history as *reliving* the past, his account of experience (*Erlebnis*) and his doctrine of types, though they are not developed here sufficiently to meet some of the chief difficulties which may be raised in regard to them. The "*Geisteswissenschaften*" are distinguished sharply from other sciences on the ground that in the former knowledge means *recreating* the past, which is possible because and in so far as the past is a realisation of "types" which may also be realised in the present. It may be objected here that care is not taken to distinguish the knowing itself from the reliving what we desire to know, which can surely at most be a preparation for the knowledge, and that the account given seems to imply that history is and should be studied not for its own sake but only because it affects the present. One of the chief advantages of the book for English readers is that it throws some light on the "phenomenological" movement, a subject where any rays which penetrate the obscurity are welcome to us. The work as a whole is an able and acute exposition, and as it was primarily intended as a long article in the "*Jahrbuch für Philosophie und phänomenologische Forschung*" and not as a separate volume we must not expect it to cover all the field.

A. C. EWING.

<sup>1</sup> Sonderdruck aus: "*Jahrbuch für Philosophie und phänomenologische Forschung*," Bd. IX., herausgegeben von E. Husserl, Freiburg in Breisgau.

*The Elements of Logic.* By ROBERT LATTA and ALEXANDER MACBEATH.  
London: Macmillan & Co. Ltd., 1929. Pp. viii + 393. 6s.

It is difficult to see what need this book supplies. It offers a brief, and, as far as it goes, clear account of inductive logic, but then so do other text-books. The order in which the various subjects are discussed is time honoured. The chapters on the problem and presuppositions of induction call for little comment. It is doubtful whether such a slight treatment of causality should be adequate "to meet the requirements of students who take logic as one of their subjects for an Ordinary or Pass Degree at the Universities". Yet the book was intended for this purpose. The chapter on enumeration, observation and experiment, though containing nothing novel, is one of the best in the book. It is unfortunate that the chapter on Mill's methods, which is more interesting than similar chapters in some other books, should give the false impression that the Joint Method is an application of the two methods of agreement and difference. The chapter on the Method of Hypothesis might usefully have been more closely connected both with the chapter on Mill's methods and with that on enumeration, observation and experiment. Perhaps it unduly stresses system, a tendency natural to a follower of Bradley.

This influence and that of traditional logic is wholly detrimental to the deductive part of the book. The first leads to a perpetual use of "unity in difference" and "universal" in a variety of senses, none of which are likely to be clear to the reader, and the ensemble of which must be confusing. The second leads to the preposterous assertion that the logical expression of every proposition is either *All S is P* or *Some S is P* or their contradictories. The only exception is that of singular propositions whose logical expression is *This S is P*. No wonder that ch. xvi on non-syllogistic mediate inferences, contains both of the following statements: "predication is the most general of all relations," and predication "is just one relation among others."

Each chapter is followed by a set of exercises, while there are further exercises at the end of the book. For the most part all these exercises require only a knowledge of the preceding chapters for correct answers; accordingly they fail to provide a stimulus to genuine thought on the part of the student.

E. M. WHETNALL.

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## VIII.—NOTES.

### A NOTE ON CLASSIFICATION OF MAXIMAL SYSTEMS AND THEIR SUBSYSTEMS.

(1) Systems can be distinguished as *finite* or *infinite*, according as the total number of entities (or 'elements') comprised in them is some finite integer or some infinite cardinal number.

(N.B.—In some systems the total number of elements will be the smallest infinite cardinal, in others one of the higher infinite cardinals—as for example in that system with respect to the relation of 'inequality' which comprises all the positive real numbers).

(2) "The set of entities (or 'elements')  $\beta$  is a **system** with respect to  $R$ " will mean:—

"If a set  $\delta$  comprises some, but not all, of the elements of  $\beta$  and if each entity comprised in  $\delta$  is also an element of  $\beta$ , then, no matter what set  $\delta$  may be, at least one entity comprised in  $\delta$  has either  $R$  or the converse of  $R$  to some element of  $\beta$  which is not comprised in  $\delta$ — $R$  being a dyadic aliorrelative relation."

(3) " $\delta$  is **included** in  $\beta$ " will mean:—

"Every element of the system  $\delta$  is also an element of the system  $\beta$ ."

(4) " $\beta$  is a **completely cyclic** system" will mean:—

"The system  $\beta$  has more than two elements and is such that, if  $x$ ,  $y$  and  $z$  are any three elements of  $\beta$ , some *subsystem*<sup>1</sup> of  $\beta$  comprises both  $x$  and  $y$  but does not comprise  $z$ ."

(5) Two elements of a system with respect to  $R$  will be said to **adjoin** one another when the first element has either  $R$  or the converse of  $R$  to the second. An element of a given system will be said to be a *terminus* in that system when it only adjoins a single other element of that system, and will be said to be a *junction* in that system when it adjoins not less than three other elements of that system. A system without any junctions will be said to be *junctionless*: one without a terminus will be said to be *non-terminal*; while one in which the number of termini is not less than unity will be said to be *terminal*. Terminal systems with one, two, and more than two termini will be distinguished as *uniterminal*, *biterminal* and *multiterminal* respectively.

(6) A system  $\beta$  will be said to be **cyclic** when both of the two following conditions are satisfied:—

(i) In the case of any two adjoining elements of  $\beta$ , there is some completely cyclic system which comprises both those elements and which is included in  $\beta$ .

(ii)  $\beta$  comprises at least one element  $z$  such that, in the case of any two elements of  $\beta$ — $x$  and  $y$ , say—, some subsystem of  $\beta$  comprising both  $x$  and  $y$  fails to comprise  $z$ .

(7) A **network** is a non-terminal system which includes a cyclic system.

(8) A **tree** is a system which does not include a network. (Hence, if no subsystem of some selected system is a network, every subsystem of that selected system will be a tree. There are, however, systems which are neither trees nor networks—e.g., a discrete linear series resembling a capital "Q," which consists partly of a closed ring or 'loop,' partly of

<sup>1</sup>  $\delta$  is a subsystem of  $\beta$  when  $\beta$  not only *includes*  $\delta$  but also has at least one element which is not an element of  $\delta$  (so that  $\delta$  and  $\beta$  are not just two names for the same system)—see MIND, Vol. xxxvii, pp. 261 and 392.

an open series which terminates. But any *open* discrete series, whether terminating—in one or both directions—or not, and whether branched or unbranched, will be a tree).

(9) " $\beta$  is an **acyclic** system" will mean:—

"If  $z$  is any element which is comprised in  $\beta$  but which is not a terminus of  $\beta$ , then at least two other elements of  $\beta$ — $x$  and  $y$ , say—can be found such that  $z$  is comprised in every subsystem of  $\beta$  comprising both  $x$  and  $y$ ."

(10) Some of the ways in which these different concepts are inter-related are either stated in or deducible from the following propositions:—

*Prop. 1.*—All completely cyclic systems are cyclic.

*Prop. 2.*—All cyclic systems are networks.

*Prop. 3.*—All non-terminal systems are either networks or trees.

*Prop. 4.*—Every system comprising not more than two fewer termini than junctions has at least two elements which are not junctions.

*Prop. 5.*—Every system which includes a non-terminal system either is junctionless or has a non-terminal subsystem.

*Prop. 6.*—No junctionless system has a non-terminal subsystem.

*Prop. 7.*—All trees are acyclic systems.

*Prop. 8.*—Every finite acyclic system is either junctionless or multi-terminal.

*Prop. 9.*—No junctionless system is multiterminal.

*Prop. 10.*—All junctionless biterminal systems are finite.<sup>1</sup>

*Prop. 11.*—No junctionless network is acyclic.

*Prop. 12.*—No finite tree has a non-terminal subsystem.

*Prop. 13.*—Every system which does not include a non-terminal system is a tree.

*Prop. 14.*—Every finite tree has at least two fewer junctions than termini.

*Prop. 15.*—Every infinite system without a cyclic subsystem is a tree.

*Prop. 16.*—In the case of any two adjoining elements of a cyclic system there will be some junctionless completely cyclic system which comprises both those elements and which is included in that cyclic system.

*Prop. 17.*—In the case of any two adjoining elements of a non-terminal acyclic system there will be some junctionless non-terminal acyclic system which comprises both those elements and which is included in that acyclic system.

*Prop. 18.*—In every junctionless system the total number of elements will be either some finite integer or the smallest infinite cardinal.

Corollary to Props. 6, 13 and 14: No finite uniterminal system is junctionless.<sup>2</sup>

J. A. CHADWICK.

### MENTAL PROCESS.

THE antithesis in virtue of which this term takes its meaning may be expressed sufficiently accurately for present purposes by saying after Alexander that objects are contemplated and acts or processes enjoyed.

*Prima facie* such processes exist. I live through and enjoy them. But

<sup>1</sup> Compare p. 314 of Russell's "Principles of Mathematics":—

"Every part of a progression, if it has a last term, has some finite ordinal number  $n$ ."

<sup>2</sup> Compare p. 192, *ibid.*: "Every (*open*) series having a finite number of terms can be shown by mathematical induction to have a first and last term." (On the other hand, 'junctionless uniterminal system' would correspond to a discrete series having either a first, but no last, term or a last, but no first, term.)

immediately we begin to call for distinct evidence of their existence there arise the familiar difficulties of Hume, James, Holt and an indefinite number more who say in effect, "I look for 'process' and only find 'object'". There seemed to be here a genuine difference in kind; on the one hand objects, data, events or whatever can be given; on the other hand that which cannot be given, what I never find but always do. On reflection the difference in kind has disappeared. The given, *das Vorgefundene*, spreads its mantle over the whole horizon; there is nothing else. The presumed processes turn out not to have been processes the moment they are examined, looked at, known. Assuming that a thing is what it is known as, this in which I think, this act or *Erlebniss*, must be regarded as part of the given, or as nothing." The view I wish to suggest is that it is the rest of the given beating upon the fraction that is present.

I presume it must have occurred to many that the only alternative to giving up 'process' in the fashion described would be to give up the other member of the antithesis. "Either there is no activity or there is nothing else." And in that case the former must appear the more eligible alternative. It is probably a trifle easier to say that there is no process than to say that the whole knowable universe is one prodigious mental process—eternal labour, divine striving, or however it may be expressed—even if it be insisted upon, that the universe so described is no object of knowledge but is that in whose life we live or in whose being we participate.

It does not seem to me that we are confined to an abrupt either-or in the matter, however. We are not compelled to say that there is process or that there is not, any more than Kant, upon reflection, felt compelled to say that there is freedom or that there is not. Kant tried to conceive the Universe as freedom *and* as necessity, the necessity being no limitation of the freedom. Is it not possible to say both "process" and "objects," when attempting to characterise all that there is, intending no limitation of either characterisation; to say that all is everywhere each; and to say this without losing the force of the difference of the two?

To Kant the given is appearances. If he is pressed to say what reality is, by contrast, he is content at first to point to a *Ding-an-sich* hidden behind the veil of appearances and not to be reached. But two considerations force him to qualify the supposed inaccessibility, first that I *am* real although I cannot know reality, and secondly that I am activity. I exist as synthesising knowledge-data, and as rising to my moral duty. His defence of God, Freedom and Immortality lies in his making the claim, and inducing us to make it with him, that while I can know only necessity I *am* free and immortal in God. In so being, I find the whole panorama of natural necessity my expression. For Kant, then, that other-than-data or other-than-appearances which is reality, is in the end process, activity; and my reality, or that wherein I am identified with "the" real, is my being activity. Appearance thus is objects contemplated, and reality process enjoying itself. Which, as has often been pointed out, is far from the conception of reality with which Kant began.

Is there any profounder way of interpreting the distinction of appearance and reality in which these two ways meet and become convincing? In what way can we believe that in being active I *am* the very reality which erstwhile seemed hidden behind the wraps and hulls of sensible appearance and therefore not to be reached? That the real is within or that the activity of self-consciousness is the principle of reality has been often held. That the real is beyond or that reality is the inscrutable 'something we know not what' behind appearances has also been often held. A truth which justifies both could only be found in a doctrine which should interpret 'act' as 'totality of objects,' and regard the real as the totality of appearances. What registers itself in us as this elusive

but ineluctable assurance of activity is the voice of all the absent appearances which together with those present would make up the total which is reality. Our activity is but our premonition of what the whole would be.

Only in some such way could we be convinced that the real beyond is the real within, which is the idealistic finding. That finding has always had its element of daring. You draw breath and say "I"; and you forthwith hold that this activity which can say "I" is the only authentic peep of ultimate reality anywhere extant. It is perhaps some relief to think so, in recent days, after the mystifications of physics in search of a *foreign* reality. It may even seem to be not entirely unlike the thing which physics itself is finding and presuming foreign. Still, the view which takes ultimate reality to be "the thing that can say 'I'" saying it, through myriads of separate foci, again and again for ever, and thereby making its eternal music—all this has its element of strangeness and daring to the mind for which the real is always and only something beyond, and never anything appearing in or as our spiritual selves. We need to reach the former point of view from the latter by convincing steps, and they seem to be those indicated. The reason we say to the physicist "the real you are looking for, and which, as you rightly suppose, lies all around and beyond you, is that which you *are* when you rise to the height of your own being" is that (a) the real is the whole of the appearances, what we know plus the remainder, which is not an estranging statement, and (b) activity, mental process, or that which I am, *is* the whole of the appearances in elliptical form. The "*I think* which must accompany all my representations" is the fore-shortened whole. Activity is the intimation by all the absent data of what their presence would mean. And as absent data become present, *i.e.*, as knowledge grows, we find our abstract schemata filling up towards activity. Accurate scientific knowledge is knowledge which "runs." And in the æsthetic consciousness reality is again presented to us in a way that it "runs." Once more, moral perfection is full, adequate activity. Utterly different as are activity and datum, the data, as they gradually fill up the field before us, complete themselves as this different thing, process or activity. In this sense activity is the real, as being (a) that which lies beyond and around, (b) that which is different from any given appearance with all the difference of activity from passivity, and which yet, being the totality of appearances, is inclusive of them and reconcilable with them, and (c) that which we ourselves are.

J. W. SCOTT.

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